TAMPERE UNIVERSITY
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FIXED COSTS TRACKING PROCESS IMPROVEMENT

The Case of the Diesel Systems Division at Bosch in Japan

Dung Thi Thuy Ho

Bachelor's thesis
August 2015
Degree Programme in International Business
Option of Financial Management and Management Consulting

ABSTRACT

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Fixed Costs Tracking Process Improvement
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The commissioner of this paper is the Diesel Systems division at Bosch in Japan, which is known as a leader in supplying Diesel Systems Technology for Japanese and Asian market. Cost controlling, in particular for fixed costs, is an essential managerial practice for all companies to generate profitable growth and to maintain a competitive edge in a volatile economic development. The newly upgraded SAP system introduced in the beginning of 2015 has driven the division to the desire of improving the fixed costs tracking process by deploying the new information technology tool. Therefore, the main objective of the thesis was to develop a new fixed costs reporting concept by utilizing SAP. The new concept aimed at eliminating manual work while providing meaningful information and highlighting crucial areas that require management's attention.

Not only various literature sources and internal documents were reviewed intensively, but also the collaboration of the researcher and colleagues working in Controlling, Finance and Administration department was carried out significantly. Sharing of knowledge and experiences across team members was essential to keep the new concept in line with the division's standards and requirements. Referring to the objective of the thesis, both qualitative and quantitative methods were applied. Qualitative approach was taken into account in the early of the research in order to gain understanding of the cost accounting process as well as how to work with SAP. In the latter part of the research, quantitative method was applied through precise measurement and analysis of statistics to prove the feasibility and applicability of the new concept.

Due to the inconsistency of data in the new SAP system, which could be only solved next year, the testing result presented here is only the most accurate estimation of the new fixed costs reporting concept's applicability for the interim period. For that reason, additional testing efforts with valid data might be required, once the new reporting concept is applied at the start of 2016.

The thesis grounded on a concrete theoretical background, delivering detailed manual guidelines on how to utilize the new concept. Nevertheless, in-depth knowledge of the inner working environment, in addition to skills in using SAP and in the area of financial analysis are strongly recommended to successfully exploit the value of the new fixed costs reporting concept.

Key words: Fixed Costs Cost Controlling Cost Accounting Cost Center SAP

CONTENTS

ABBREVIATIONS AND TERMS

APC	Actual Product Costs
BP	Business Plan
CE(s)	Cost Element(s)
CF	Current Forecast
CFA	Controlling, Finance and Administration
CO	Controlling module in SAP
DGS-ES/RBU	Regional Business Unit for Exhaust Systems and Sensors
DS-JP	Diesel Systems division in Japan
EO	Executive Officer
FC	Finance and Administration
FI	Finance module in SAP
fix	fixed
GB	Business area (SAP)/Division (Geschäftsbereich)
IT	Information Technology
JPY	Japanese Yen
KPI	Key Performance Indicator
MBR	Monthly Business Report
MG	Manufacturing
NE	Engineering/R&D
OOIE	Other Operating Income and Expense
OVC	Operating Value Contribution
P/L	Profit and Loss Statement
PPC	Planned Product Costs
QM	Quality Management
RG	Regional subsidiary (Regionalgesellschaft)
RO	Regional organization (Regionalorganisation)
SA	Sales
SD	Sales and Distribution module in SAP
SG&A	Selling, General and Administration
var	variable
YTD	Year to date

1 INTRODUCTION

1.1 Background

Costs are the core factor determining profitability of the business operation together with sales revenue. The role of cost monitoring becomes even more important in a fluctuating economic environment as today. Securing values achieved in the past and generating profits are possible only if companies respond quickly and flexibly to the revenue volatilities and, particularly in case of regression, are able to adjust costs accordingly. Cost monitoring is the main topic in *Cost Reduction and Control Best Practices: The best ways for a financial manager to save money* issued by Institute of Management and Administration (IOMA). The institute claims that the companies with proper cost discipline and cost control strategy would "adjust more rapidly to so-called trigger events" (2006, 3). The global crisis in 2008 is an example, whose impacts still remain until now. This is why, with the corporate cost-control strategies, firms are ready to grow again when the business cycle turns to upswing stage. A survey conducted by IOMA concerning "the financial techniques they used over the past year that had the most impact on corporate value" revealed that more than 140 participants, out of almost 200, states: "improvements to reporting as the top way to enhance corporate value" (2006, 15–18). Therefore, it can be seen that reporting has a huge impact on cost controlling processes.

Fixed costs are essential for any company to project profit and to calculate the break-even point. As fixed costs are developed independently of the turnover, the practice of controlling fixed costs is vital to ensuring the growth of profitability, and securing the financial position in an unstable economic world. Similar to any firm in the automotive industry, the Diesel Systems division at Bosch in Japan needs to be more responsive to the volatile business environment in order to sustain its position as a leader in the market. The division upgraded the SAP system to catch up with the Bosch Group's worldwide standardization and unification of information, and to optimize the day-by-day operations. The presence of the new system has generated a great demand of improving fixed costs reporting for a timely and efficient fixed costs tracking.

With a sincere interest in management accounting, cost accounting and cost management, especially along with a five-month internship at Bosch's Diesel Systems division

in Japan (DS-JP), the author realizes the necessity of fixed costs internal controlling. Therefore, the author has chosen "*Fixed costs Tracking Process Improvement: The Case of the Diesel Systems Division at Bosch in Japan*" as the topic for her graduate thesis. The thesis discusses the way to construct a new fixed costs reporting concept under the newly introduced SAP system that has potential to optimize the controlling processes of the division.

1.2 Thesis objectives

The main objective of this thesis is to develop a new reporting concept for fixed costs tracking of DS-JP by utilizing SAP. Fixed costs steering is one of the most important controlling practices as it leverages the potential market risks. With the old SAP system, the division spent approximately eight hours per month to prepare a fixed costs report, which was only a database to track fixed costs. Moreover, the working routine in the past does not fit to the newly introduced systems anymore. Therefore, the division has been searching for a new solution to track fixed costs quickly and efficiently, in conjunction with the adoption of the new SAP system. The new reporting concept for fixed costs tracking should meet the following requirements:

- Display in excel format
- Plan and actual data are downloaded directly from SAP
- Eliminate manual work when updating the report
- Easy to use and analyze
- Provide meaningful information
- Highlight important areas for management's attention

The new concept for fixed costs reporting not only provides adequate and accurate information for a reliable management reporting and a target-oriented steering, but also speeds up the reporting process for timely decision-making. Less time spent in reporting would allow more capacity for meaningful activities essential to the company values. The new concept has to be in line with the standard procedure of internal reporting regulated by the Bosch Group. By utilizing the newly upgraded SAP system, the new concept is expected to support the Controlling, Finance and Administration department (CFA) in improving fixed costs tracking process.

1.3 Research approach and methodologies

1.3.1 Constructive approach

The constructive research approach is widely used in the field of social sciences. It is considered as an approach to construct innovative solutions for real-life problems. In an article called *What is a constructive research approach?*, Lukka states that a construction could be anything such as a new theory, framework, model, plan, organizational structure, commercial product, etc. as long as it is different from the ones existed before. The constructive research approach is defined by the following main features:

- "focuses on real-world problems felt relevant to be solved in practice,
- produces an innovative construction meant to solve the initial real-world problem,
- includes an attempt for implementing the developed construction and thereby a test for its practical applicability,
- implies a very close involvement and co-operation between the researcher and practitioners in a team-like manner, in which experiential learning is expected to take place,
- is explicitly linked to prior theoretical knowledge, and
- pays particular attention to reflecting the empirical findings back to theory." (Lukka, 2000.)

Based on the background study, together with the objectives of the thesis, the constructive research approach was chosen. The ultimate goal is to construct an applicable fixed costs reporting concept by deploying SAP. In order to provide a practical solution for improving the process of fixed costs tracking, the author worked closely with other colleagues in CFA, in which sharing of knowledge and experiences across team members is very important. Finally, the thesis also showed an attempt for testing and implementing the new concept. The test was carried out to evaluate the solution's practical applicability before leading to the application in DS-JP.

1.3.2 Research methods

Qualitative and quantitative are the two methods used in research. Qualitative method refers to describing the whole picture of the research topic by collecting, analyzing and interpreting data. It targets the areas of "meaning, concepts, definitions, characteristics, metaphors, symbols, and descriptions of things" (Anderson, 2006, 3). Meanwhile quantitative method focuses on counting, measuring things and constructing statistical models to explain the object. Hence, quantitative method is more conclusive in nature and qualitative is more in exploratory ways (Explorable: Quantitative and Qualitative Research 2009).

Due to the objectives of the research, the author made use of both methods. To create a fixed costs report out of SAP, the understanding of the whole cost accounting process as well as how to work with SAP are crucial. Therefore, qualitative approach was taken into account in the early stages of the research. In the testing, through numerical evidence, the author gave a clear answer of the feasibility and applicability of the new reporting concept with data acquired from SAP. As a result, quantitative approach was applied for the latter part of the research through precise measurement and analysis of statistics.

1.3.3 Data collection

Textbooks, journals and online sources relating to cost accounting and cost management as well as SAP were reviewed thoroughly to establish a concrete theoretical base for the development of the new reporting concept. The findings in this thesis would be used internally for fixed costs tracking within DS-JP. Consequently, many documents that are only available on Bosch's intranet and at CFA such as Unit Costing guidelines, Profit and Loss statement's components, and results from the team meetings were collected as well. These internal sources of information not only support the theoretical base, but also ensure the new reporting concept is in line with the division's requirements and standards. As a consequence, the author focused on gathering secondary data, which has been already collected and available from other sources for the research purposes. Nevertheless, it is worth mentioning that going hand-in-hand with the secondary data was primary data. As a nature of the study is to develop a new fixed costs reporting

concept, the researcher created the primary data by herself based on the personal observation throughout the effort of testing and implementing the new concept. Therefore, both primary and secondary data were collected to facilitate the study.

1.4 Thesis structure

The thesis consists of six main chapters. The main goal of the *Introduction* chapter is to give an overview of the background study and explain the necessity of the research. It also provides the information about research methodologies employed by the author. The second chapter *The Case Company* introduces the Bosch Group from worldwide level down to the division where the thesis is applied for; including its history, business sectors and organizational structures. Besides, this part focuses on introducing the standard controlling processes at the group, as well as identifying challenges that CFA department might face in improving fixed costs tracking process at DS-JP. *Theoretical Framework* placed in chapter 3 establishes an academic foundation for the conduct of the study. The knowledge of cost accounting, cost behavior, and cost splitting in SAP was widely applied. Next chapter is *The Major Drawback and Suggested Solution*. As what it is called, the chapter points out the main challenge preventing the division from deploying SAP for fixed costs tracking in this year 2015. At the same time, the author also comes up with a suggested solution. Chapter 5 *A Template for Fixed Costs Report* introduces the design of the fixed costs report resulting from the implementation of the new concept, together with the testing's description and guidelines/tips for updating the report on a monthly base. The summary of the research' results and a short discussion about findings, and recommendations are located at the last chapter *Discussion*.

2 THE CASE COMPANY

2.1 Introduction of the Bosch Group

2.1.1 Bosch worldwide

The Bosch Group is a multinational company specializing in engineering and electronics, whose headquarter is in Gerlingen, Germany. The company was founded in Stuttgart by Robert Bosch (1861-1942) in 1886. (Wikipedia: Robert Bosch GmbH.) It has a long development history. Facing challenges and difficulties of the global economy, Bosch has proved itself as a global leader in supplying technology and services. The company's trading slogan "Invented for life" is its commitment to continuously introduce innovative, exciting and useful products as well as solutions to improve life quality. Nowadays, the Bosch Group comprises Robert Bosch GmbH and 440 subsidiaries and regional companies in 60 countries. The company's products and services are represented in 150 countries with 360,000 associates generating sales of nearly 49 billion Euros (Bosch today 2015, 5.)

The main success factors that help the group gain a strong global presence as today are sufficient investment on research and development, far-seeing strategic planning, and diversity within the company. Innovation is a core factor to be a leader in this field, thus, Bosch puts many efforts in research and development. According to the company's statistics, 5 billion Euros were invested solely in 2014 with 45,700 associates working at 94 engineering sites worldwide. The company ranks on top for patent applications with 18 patents per working day on average. Equivalently, the team comes up with a new invention every 26 minutes (Bosch today 2015, 7–9.) Besides that, farsighted strategies and financial independence contribute greatly to the success of the group. Last but not least, diversity can be seen as a competitive advantage to ensure the sustainable growth for the company by increasing creativity and problem solving skills as well as intercultural competencies.

2.1.2 Business sectors and assigned divisions

Bosch's four business sectors are Mobility Solutions, Industrial Technology, Consumer Goods, and Energy and Building Technology, in which Mobility Solutions sector accounts for 68% of total sales (Bosch today 2015, 10–17). More details about Bosch's divisions and product ranges across sectors are listed in table 1.

TABLE 1. Assigned divisions and product ranges throughout business sectors[1]

		Divisions	Product ranges
Business Sectors (BB)	**Mobility Solutions (BBM)**	• Gasoline Systems (GS) • Diesel Systems (DS) • Chassis Systems Control (CC) • Electrical Drives (ED) • Starter Motors and Generators (SG) • Car Multimedia (CM) • Automotive Electronics (AE) • Automotive Aftermarket (AA) • Automotive Steering (AS)	ABS (antilock braking system, ESP (electronic stability program), Common-rail high-pressure diesel direct injection, Gasoline direct injection DI-Motronic, Hybrid drive, etc.
	Industrial Technology (BBI)	• Drive and Control Technology (DC) • Packaging Technology (PA)	Industrial Hydraulic Cylinder, Wind Turbine Gearboxes, Vertical tubular bags and blister packs, stand-up pouches, etc.
	Consumer Goods (BBG)	• Household Appliances • Power Tools (PT)	Power tools, Measuring tools, Garden tools, Accessories, etc.
	Energy and Building Technology (BBE)	• Security Systems (ST) • Thermotechnology (TT)	Fuel-cell heater, Decentralized energy management, Brine-to-water heat pump, Solar thermal collector, etc.

[1] Bosch. 2014. Annual Report. Fundamental information about the group.

2.2 Bosch in Japan, and RBJP - Bosch Corporation

A global presence of the Bosch Group as today is the result of deliberate expansion strategy. Acquisitions not only reinforce the group's market position in its operating segments, but also help to balance the company's business structure. In 1911, Bosch started its operation in Japan firstly under the form of a repair workshop for Bosch products. Later on it gradually acquired a majority holding of its biggest Japanese affiliated companies, Zexel Corporation. Over 50% of the acquisition process was completed in 1999. In 2005 the corporation and other Bosch companies in Japan were formed as Bosch Corporation, headquartered in Tokyo[2].

As part of the Bosch Group, Bosch in Japan has the strong presence in all four business sectors. It is the largest foreign automotive technology supplier and the second largest German company in Japan. Nowadays, Bosch has 39 locations throughout Japan representing Bosch Corporation (RBJP), Bosch Rexroth Corporation, Bosch Packaging Technology K.K., Bosch Security Systems Ltd. and other affiliates with roughly 6,700 associates generating sales of 343,000 million yen[3]; in which RBJP accounts for 295,305 million yen of sales revenue generated by 6,131 employees[4]. The corporation's main customers are Isuzu Motors Ltd., Nissan Motor Co., Ltd., Subaru Co., Ltd., Toyota Motor Corp., Jatco Ltd.[5].

2.2.1 DS-JP - Diesel Systems division in Japan

The current global forces of strictly controlled emission standards and reducing fuel consumptions has led to increasing demand of diesel engines, which provide future-proof solutions for sustainable development of all market segments. In response to the current mega trends of powerful, clean fuel and cost efficient solutions for transportation, DS plays an important role in Bosch's farsighted strategy. DS-JP is a member of the DS-organization worldwide and one of the group divisions in Japan operating in Mobility Solutions business sector. The division supplies a wide array of diesel injection systems for passenger cars and commercial vehicles. Throughout the International

[2] Bosch. History of Bosch Group in Japan. Read 18.06.2015. http://www.bosch.co.jp/en/japan/history/
[3] Bosch. 2015. Bosch Group in Japan. Fact spreadsheet. Internal source.
[4] C/CCR1-JP. 2015. Bosch in Japan - Fact and figures. Internal source.
[5] C/CCR1-JP. 2015. Bosch Corporation CY2014 Corporate Profile. Internal source.

Production Network, DS-JP provides customers products that meet international standards with guaranteed JIT (just in time) delivery regardless of the customer' geographical distance. Nowadays, the division sustains its growth in Japan and Asia via highly competitive products, innovative solutions and international DS networks[6].

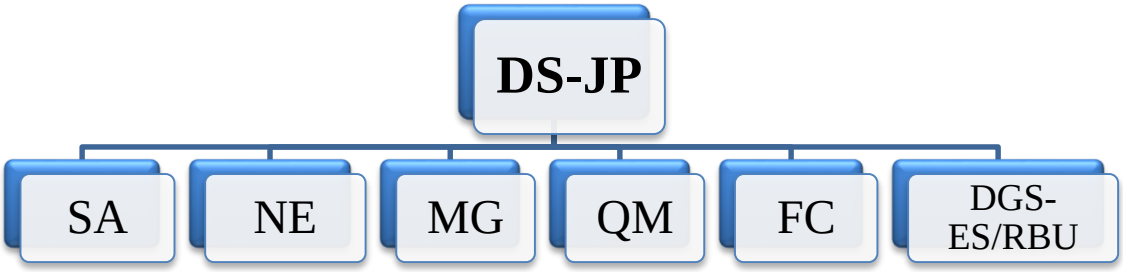


FIGURE 1. Diesel Systems Japan Organization chart

In terms of EO (Executive Officer), DS-JP comprises five main business functions that are SA, NE, MG, QM, FC, and one regional business unit as described in figure 1. DGS-ES/RBU-JP is the Regional Business Unit for Exhaust Systems and Sensors in Japan, which is newly founded. DS/SA-JP takes the responsibilities in the area of sales and project management for JOEM (Japanese Original Equipment Manufacturer) customers[7]. Beyond its purely objective of selling Bosch products, DS/SA-JP takes part in demand creation and maintaining customer relations by timely responding to the customer' needs and ensuring high quality of after-sales services. Meanwhile, DS/NE-JP is responsible for engineering, research and development. In the industry of Mobility Solutions, where everything is on the moving pace, the continuous improvement of the existing products as well as the introduction of innovative solutions are the core competing factors to sustain and expand the market share. DS/MG-JP is the manufacturing function in the division. By working closely with DS/SA-JP and DS/NE-JP, DS/MG-JP not only produces high-grade products, but also involves in restructuring of product classes to satisfy customer's requirements. DS-JP considers customer satisfaction as a priority mean to measure its performance. Therefore, the quality management function DS/QM-JP assures all the products are qualified to deliver. Finally yet importantly, Finance and Administration DS/FC-JP is a supporting function for internal controlling activities and management.

[6] About DS-JP. Bosch's intranet. Internal source.
[7] About DS/SA-JP. Bosch's intranet. Internal source.

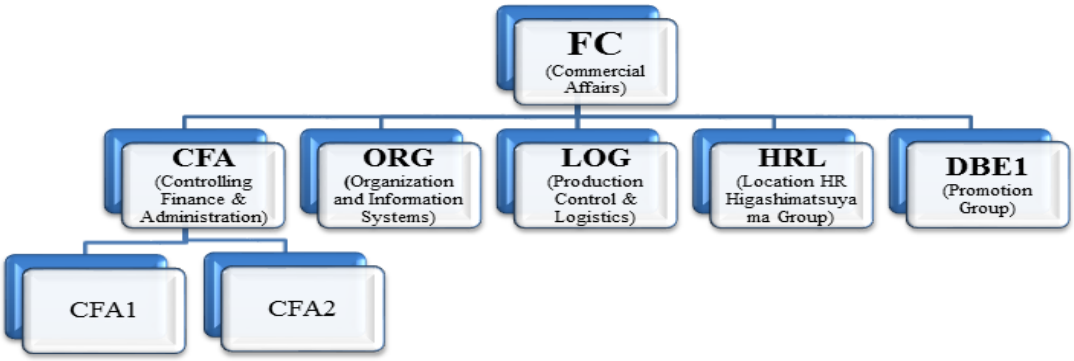


FIGURE 2. Finance and Administration Organization chart

Mission of DS/FC-JP is to ensure a sustainable success of the business in alignment with its strategic targets. It can be seen from figure 2 that DS/FC-JP is responsible for controlling, IT coordination, logistics, human resources, and the deployment of business excellence for DS-JP. DS/FC-JP supports the target achievement via constantly monitoring and continuously improving of the operating processes, in a flexibly and proactively reacting manner to changes in the business environment. The collaboration of all functions within DS-JP ensures a smooth operating process and the achievement of target profit.

2.2.2 CFA - Controlling, Finance and Administration department

As visible in figure 2, CFA is a department within DS/FC-JP. It contributes to the target of profitable growth by undertaking cross-functional financial controlling including key data reporting, result analysis, forecasting and consulting.

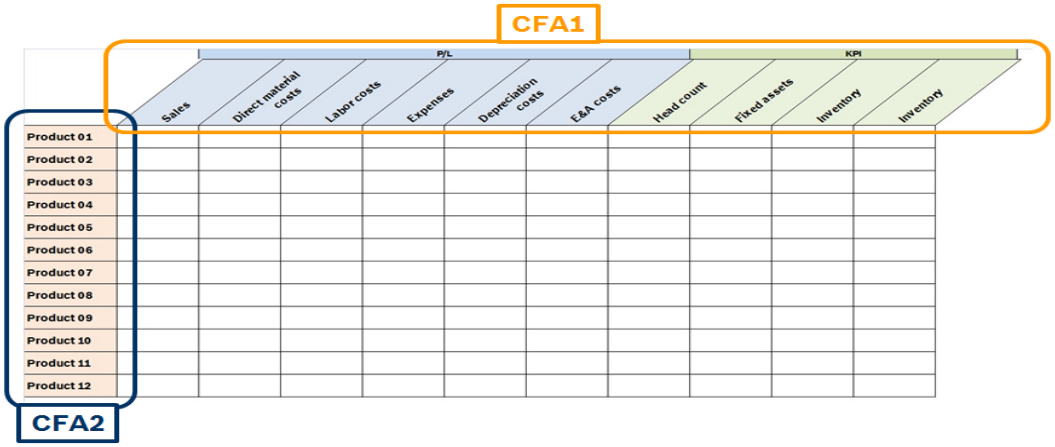


FIGURE 3. A matrix of CFA's responsibility (Introduction of Diesel Systems Controlling DS/CFA-JP, 2015, internal source)

There are two sub-departments in CFA, which are CFA1 and CFA2. Regarding to figure 3, CFA1 is responsible for overall coordination of business planning, Business Plan follow-up, monthly controlling, and reporting of P/L (Profit and Loss Statement). Moreover, CFA1's controlling tasks also relate to headcount, overtime, productivity management, KPI (Key Performance Indicator), license, royalty, and tax requirement. Whereas CFA2 uses base data provided by CFA1 for the main activities of product controlling, PPC (Planned Product Costs) costing, investment analysis and cost estimation.

2.3 Controlling practice at the Bosch Group

2.3.1 Controlling processes

The controlling processes at Bosch take place through three main stages, BP (Business Plan), CF (Current Forecast) and MBR (Monthly Business Report).

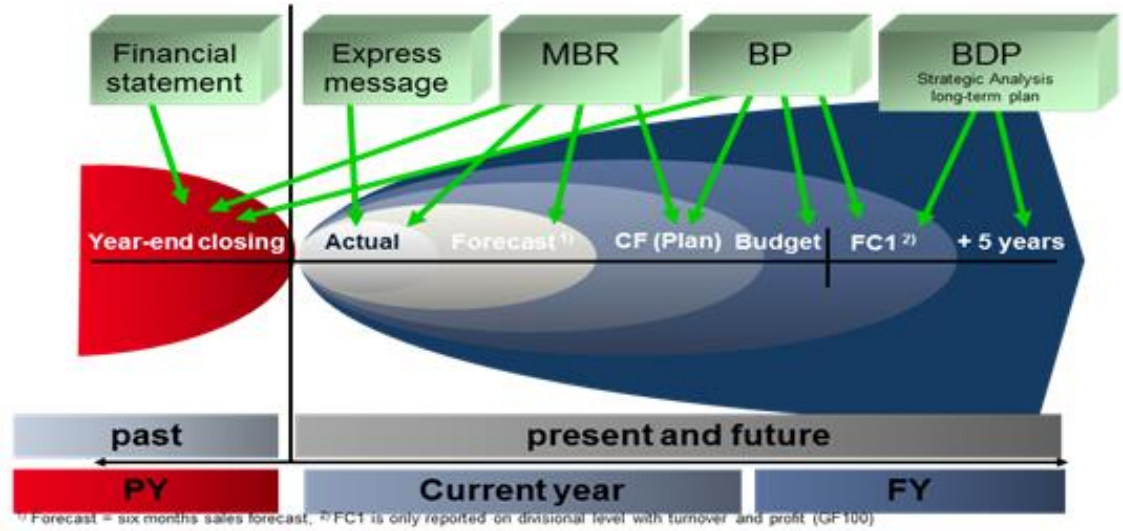


FIGURE 4. Controlling processes at the Bosch Group (Concept of Controlling, 2015, internal source)

As can be seen from figure 4, BDP (Business Development Planning) is a long-term strategic planning in a scope of 5 years with a pre-defined set of strategic courses of actions. Meanwhile, BP deals with a medium-term future by foreseeing business direction of the company in the next year. The term is often displayed in the abbreviation of "BP" and "following year". For example, BP15 is the Business Plan of the fiscal year

2015 that was prepared in 2014. BP is built up by defining fundamental orientations of the Bosch Group such as corporate structure and growth targets. The planning process includes top down planning and bottom up planning that require goal settings and communication at all hierarchical levels. The targets are identified by the board of management and then passed down to GB, RG and plants. The business units analyze their own business situations and derive at appropriate measures to achieve targets. The results produced from the business units' analysis are then collected and compared with the pre-setting targets of the group for the BP consolidation purpose. Unlike BP, which is done once a year, CF is calculated quarterly and displays all the details in P/L as well as KPI. CF can be understood as a revision of BP that allows the company to closely and frequently monitor its performance by comparing against BP and the latest actual data. The final stage of controlling processes is MBR. Conducted on monthly base referring to the data that is contributed by every department, this is the main business performance report within Bosch. It is used to validate CF, and to compare actual data to targets identified during BP time.

The controlling practice at Bosch is carried out at different levels. At Corporate Controlling level, the board of management and controllers go through strategic planning, in addition to investment planning steering of GB, RO and RG. Then the controllers provide guideline competence, and finally proceed to the consolidation and annotation of BP and MBR. Controlling at Business Unit level includes two sub-sets which are controlling at GB and Controlling at Plant/RG. At GB level, controlling tasks comprise strategic and operational planning, reporting and actual/CF comparison, steering of GB, steering of plant and RG. At Plant/RG level, the process includes cost accounting and calculation, cost planning and monitoring, variance analysis and economy of scale monitoring[8].

As a big multinational company, Bosch applies several tools and systems for its controlling purposes. BIT (Bosch Information Tool) for controlling is a new tool functioning as a uniform IT Platform replacing the current legacy systems and Excel solutions by using SAP BPC (Business Planning and Consolidation) and BW (Business Information Warehouse) as the base data. The administration of BIT is done by using a web-administration user interface. End users can access the data via the EPM (Enterprise

[8]DS/CFA-JP. 2015. Concept of Controlling. Internal source.

Project Management) Excel front-end. As a result, the controllers can analyze great amounts of data from different perspectives, and generate ad hoc reports with ease, which after all increase the efficiency and speed of controlling operations[9]. The data is uploaded to HFM (Hyperion Financial Management) once it is taken out of SAP by BIT. HFM is the only database that is strictly centralized for the purpose of consolidation of financial data and generation of reports and analysis. HFM is a comprehensive web-based application developed by Oracle that eliminates all interchange data processes[10]. Every month MBR is uploaded to HFM.

2.3.2 Challenges in improving fixed costs tracking at DS-JP

Diversification of the Bosch Group resulting from the business structure of various divisions and business units makes the company different in terms of return on sales and employment of funds. Hence, any analysis of profitability and attractiveness based solely on the return on sales that is often known as operating profit margin, is inadequate. That is the reason the company applies a value-based management concept with OVC (Operating Value Contribution) serving as the key performance indicator. In addition to other costs, OVC measures whether the company and its divisions/business units earn the cost of the invested capital or not, which is the core element of this concept. OVC is calculated by deducting costs and cash effective depreciations, along with the capital charges, from sales revenue. In this context, OVC is a purely pre-tax figure[11]. The volume of fixed costs, which is an independent factor of sales, contributes to the determination of the value of OVC. Therefore, fixed costs monitoring is an essential part of controlling practice that takes place on a monthly base.

[9] G4/PJ-SPK E-Learning. 2015. Information Tool for Controlling - An Overview. Internal source.
[10] C/AOF. 2015. HFM training for Reporting user. Internal source.
[11] C/AOF. 2013. Bosch Value Concept - manual for the management concept. Internal source.

TABLE 2. Volume dependence and short-term adjustability of fixed costs (Bosch Value Concept - manual for the management concept, 2013, internal source)

SCENARIOS	FIXED COSTS
Short-term adaptable	• Advertising • Travel costs • Communication costs
Short-term not immediately adaptable	• Personnel costs: indirect employees • ...
Short-term not adaptable	• Depreciation • Capital charge on fixed assets • …

As visible in table 2, the fixed costs tracking process should somehow highlight the right components of fixed costs that can be adjusted under the divisional control. In the past, CFA department of the DS-JP entity has spent approximately eight hours per month to prepare the monthly fixed costs report. This year, after upgrading the SAP system to meet the Bosch Group worldwide standard, the department expects to utilize it as much as possible. The main objective is to develop a new reporting concept to track fixed costs with data obtained directly from SAP. However, the challenges are:

- Data of previous year is not available in SAP, given that the company has just started to apply the new system this year.
- The final BP that includes additional targets defined after the submission of BP15 to headquarter is only available in SAP for SG&A expenses. The BP for PPC has not included the additional targets of cost reduction yet.
- Fixed and variable costs are mixed up in the system. Specifically, high portion of actual fixed costs is in SAP than they should be.
- Standard fixed costs report is available in the system, but it is not in line with the controlling department's expectation. Therefore, the fixed costs report would need to be created in Excel with smart formulas to eliminate manual work of updating.
- Despite its importance, internal reporting is currently in lower prioritization in terms of urgency compared to correcting actual costs in SAP and P/L.

The implementation of the new SAP system for Bosch in Japan, where DS-JP is part of the project, has been carried out for two years. Many other entities of the Bosch Group have already applied the new system. The newly introduced SAP enforces the world-wide improvement process of standardization and unification of information. It provides a highly integrated environment to control the business process. Switching from a regional control system to a much more automatic and integrated one at a global level is a very complex process. The challenges presented in this thesis are most likely originated from different logics between the old and the new system. Section 4.1 will point out the major drawback that prevents the adoption of the new reporting concept in the current year. At the time being, the division still continuously adapts to the new process in order to fully benefit from the standardized system in the long run.

3 THEORETICAL FRAMEWORK

3.1 Cost accounting for the purpose of cost controlling

Cost accounting plays a crucial role in providing information to the management. Nowadays, the business factors such as globalization, advances in manufacturing technologies and information systems are leading to the need of more detailed, accurate and timely information. Therefore, the role of cost accounting becomes stronger than ever to meet the requirements of the new business environment as well as to support an organization in getting on top of the competition. Periasamy (2010, 298–300) also emphasizes "cost accounting is one of the important disciplines of accountancy to give proper information required to the management for effectively discharging its functions such as planning, organizing, controlling, directing, co-ordinating and decision making". He addresses the important objectives of cost accounting as below:

"(1) Ascertainment of cost.
(2) Determination of selling price.
(3) Cost control and cost reduction.
(4) Ascertainment of profit of each activity.
(5) Assisting Management in decision making.
(6) Formulating business policy.
(7) Matching costs with revenue."

Based on the scope of this thesis, the researcher mainly focused on clarifying the role of cost accounting in supporting effective cost control. The task of cost accounting is to systematically record and prepare costs in order to provide data for operational planning and controlling. To understand the cost accounting process, there is a need to get used to fundamental cost concepts and terms such as cost accumulation, cost assignment, cost allocation, cost object, direct and indirect costs. In *Management and Cost Accounting*, Bhimani, Horngren, Datar and Foster (2008, 38–40) define these terms in a professional and technical way, in which "cost object is anything for which a separate measurement of costs is desired". Cost object can be anything from a product, service to an activity or a department as long as it satisfies the requirement of knowing how much does that certain thing cost? There are two basic stages in a costing system that are cost accumula-

tion and cost assignment. Cost accumulation is an act of collecting all the cost data related to the particular organized category, such as labor, material, etc. through an accounting system. In the next stage, these costs will be assigned to cost objects, which is known as a practice of cost assignment. Also at this stage, clarification of direct costs and indirect costs takes place. The costs that can be traced in an economically feasible way are defined as direct costs; while those costs that are allocated to a certain cost object and cannot be traced are called indirect costs. The term indirect costs and overhead costs can be used interchangeably (Bhimani et al. 2008, 50). To assist the understanding, the relationship of direct and indirect costs to a cost object is displayed in figure 5 as below.

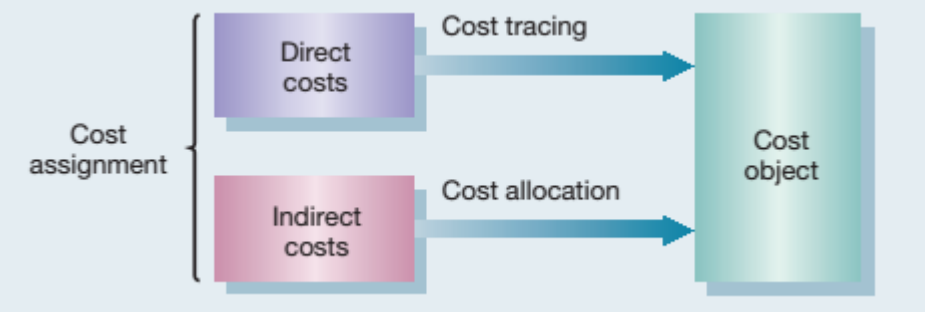


FIGURE 5. Relationship of direct and indirect costs to a cost object (Bhimani et al. 2008, 39)

According to figure 5, the act of assigning direct costs to the particular cost object is known as cost tracing and the assigning of indirect costs to a cost object is called cost allocation. By providing accurate and timely information, cost accounting supports the implementation of business plan as well as the business performance tracking. For this reason, cost accounting is essential to effective controlling processes.

3.2 Verification of fixed and variable costs

Based on the variability of costs, Hansen, Mowen and Guan (2009, 51–54) define cost behavior as a term used to describe the changes of costs when changing the level of output. There are three types of cost behavior, which are fixed costs, variable costs and mixed costs. Fixed costs are costs that are unchanged, or in other word, are constant *in total* within the relevant range of the activity driver. The activity driver can be seen as an output level, such as units produced, or associate-related time like working time,

productive hours, etc., which is varied and can be measured by quantity or time factors. The figure 6 below describes fixed costs behavior.

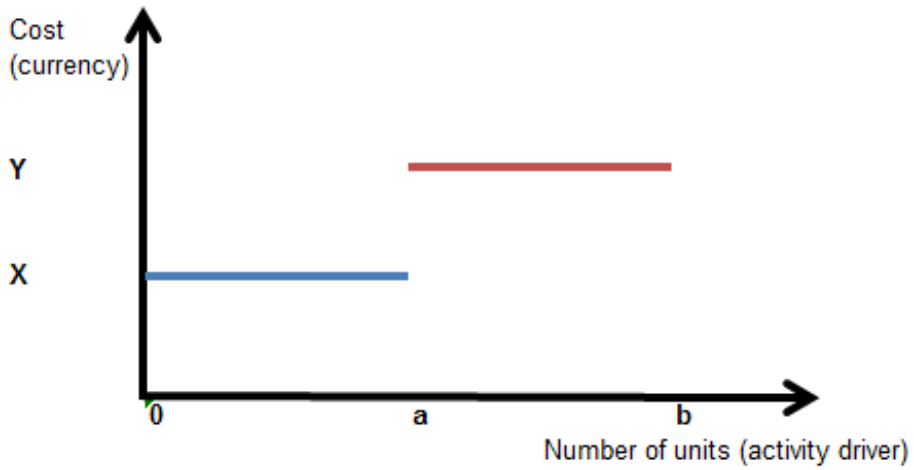


FIGURE 6. The graph of fixed costs behavior (Hansen et al. 2009, 52, modified)

Looking at the graph, fixed cost **X** is constant within the range from **0** to **a,** and fixed cost **Y** remains unchanged over **a** to **b** units. Therefore, costs are fixed in a certain relevant range, where the assumed cost relationship is valid. The term *in total* emphasizes that total costs are fixed within that range, but the fixed costs per unit are changeable as the activity driver varies.

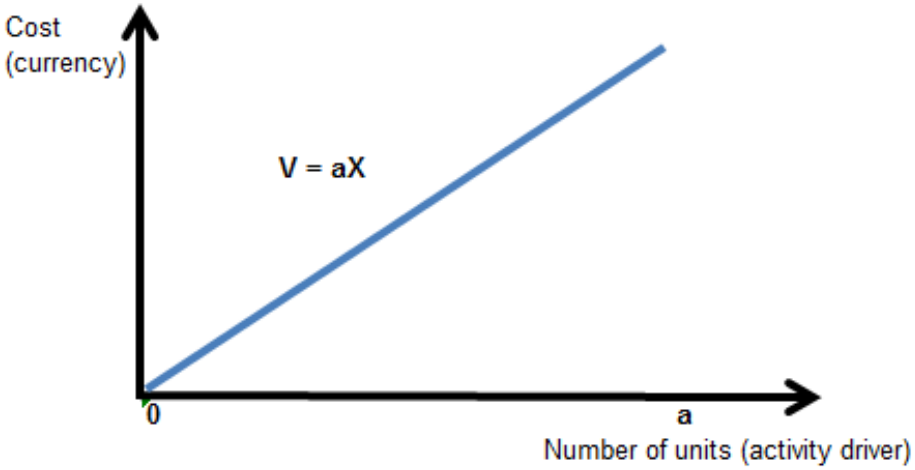


FIGURE 7. The graph of variable costs behavior (Hansen et al. 2009, 53, modified)

While fixed costs are constant, variable costs in total do change proportionally as the level of activity driver changes. In contrast to unit fixed costs, the variable costs per unit are unchanged within the relevant range. According to figure 7, total variable costs can be represented by the linear equation, in which **V** is total variable costs, variable costs

per unit is noted as **X** and **a** is the number of units of the driver. **V** increases in direct proportion to increases in **X** at rate **a**.

Referring to economists, there is no such a thing as fixed costs in the long run, all costs are variable. However, in the short run, some costs might be considered as fixed. The thing is long run and short run are very abstract terms. The length of them is based on the management judgment as well as the need of a company for fixed and variable costs clarification.

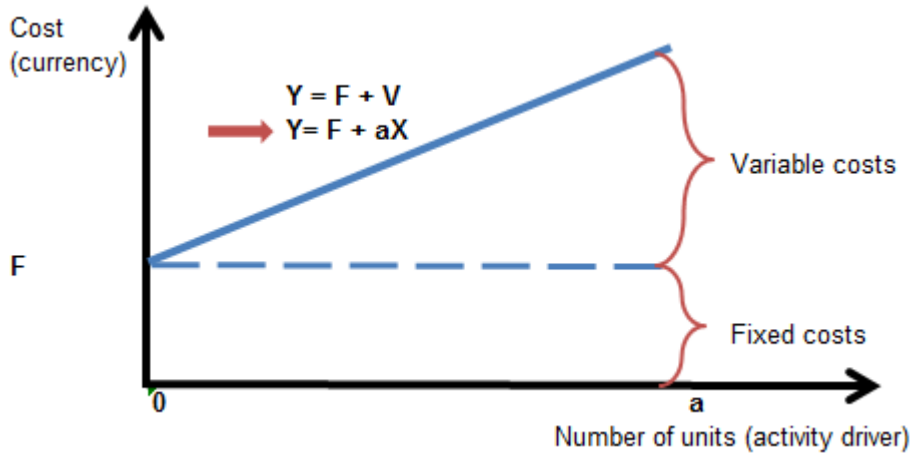


FIGURE 8. The graph of mixed costs behavior (Hansen et al. 2009, 54, modified)

The last type of cost behavior is mixed costs, which are also known as semi-fixed costs or semi-variable costs. They are costs that consist of both fixed and variable costs. For instance, an employee's salary can be understood as mixed costs because it includes a base salary and compensation for overtime. The base salary is referred as fixed costs, while the compensation is changeable accordingly to the amount of overtime working hours that leads to variable costs. From a bigger point of view, the cost structure of an entire organization or a department is a mixed cost because there are variable costs incurred on the baseline of fixed costs to support the department's activities. The linear equation of mixed costs is displayed in figure 8. If **Y** is the total mixed costs, its components respectively are **F** and **aX,** in which **F** is represented for fixed costs and **aX** is the total variable costs with unit variable costs of **X.**

Due to the need of business controlling, companies might want to have strictly separate fixed costs and variable costs. Also in *Cost Management Accounting & Control*, Hansen et al. (2009, 59–71) lists three formal and basic mathematical methods of separating

mixed costs. They are the high-low method, the method of scatter plot, and the least squares method. Each method has its own advantages and disadvantages. For example, the high-low method is easy to apply, but it might misstate the cost relationship. The scatter plot method examines the cost relationship visually, but it is considered as subjective method. The last one is the most powerful method. It allows a cost analyst to assess the cost equations' reliability. Nonetheless, applying the least square method manually is a very complex task. Fortunately, a cost analyst can use the regression programs such as Microsoft Excel to perform computations.

In this thesis, however, none of aforementioned methods were applied due to its scope as well as the division's goal. Instead, managerial judgment was used to determine cost behavior. This is the most widely used method in practice (Hansen et al. 2009, 71–72). Managers' experience and past observation together with accountants and controllers' knowledge will decide costs are fixed or variable. There would be errors if the management's assessment is wrong. However, if the managers, accountants and controllers have experience, knowledge as well as deep understanding of the firm and its cost structure, it would yield a good result. The company can benefit from the simplicity of this method.

3.3 Cost splitting in SAP

Primary and secondary are two types of cost elements (CEs) in controlling module (CO). As what Jones and Burger (2009, 392) explain in *Configuring SAP® ERP Financials and Controlling*: "In simple terms, primary cost elements can be directly posted to via the posting that occurs in another module, such as a posting to FI or SD, whereas secondary cost elements must be acted upon by another transaction that will determine the cost element for you, therefore posted only within CO". To be more precise, primary CEs originate from outside CO, which have counterparts in FI. On the other hand, secondary CEs can only be created within CO and have no FI counterpart. As primary CEs are linked to the general ledger in FI, they can be understood as costs that arise from external sources such as labor costs, power and fuel, external services, etc.

Being part of the overall business planning process, fixed and variable plan costs are verified by the planning of primary costs on cost centers via transaction code KP06 in

SAP (SAP Help Portal: Executing Primary Cost Planning). This transaction is used to input plan costs of specific cost centers. The database is the BP prepared in Excel, where fixed and variable costs are defined on cost element level of each cost center. Then the administrator will upload the organization's BP directly to the system (Ummadisetti, 2013). This is how plan fixed and variable portions are displayed in SAP for comparison purposes.

Actual cost splitting is required for comparison of target and actual costs, in addition to the calculation of actual prices. The system splits actual costs into fixed and variable portions based on the process of business planning. In simple terms, the actual costs of a CE are either fixed or variable based on how its plan data is defined. The target costs are the base for splitting actual costs into fixed and variable. If a CE has no plan cost, the system will automatically treat its actual costs as fixed. (SAP Help Portal: Actual Cost Splitting.)

4 THE MAJOR DRAWBACK AND SUGGESTED SOLUTION

4.1 The major drawback of the new reporting concept's adoption in 2015

A CE on a specific cost center is defined as fixed or variable during business planning for the use of the whole next year. The current new system is much more automatic compared to the old version in term of bookkeeping. For instance, when the division makes any purchase orders, the costs would automatically link to CEs. While in the past, the costs were booked independently in different CEs. That is to say, presently the division is using different CEs due to the new upgraded system. At the time the team transferred BP15 to the new system, the plan was prepared in 2014 based on old CEs of the old system. As a result, when new CEs show up in YTD (Year to date) data, they become CEs without plan cost. According to the actual cost splitting rule, the system will automatically treat the actual costs of CEs that have no plan data as fixed costs. This is the main reason leading to the mix up of variable and fixed costs in the new system. The problem arises because a certain variable CE on a specific cost center is mistreated as fixed costs. In case there is a presence of fixed CE without plan data, its actual costs would be considered as fixed costs that after all would not affect the YTD data.

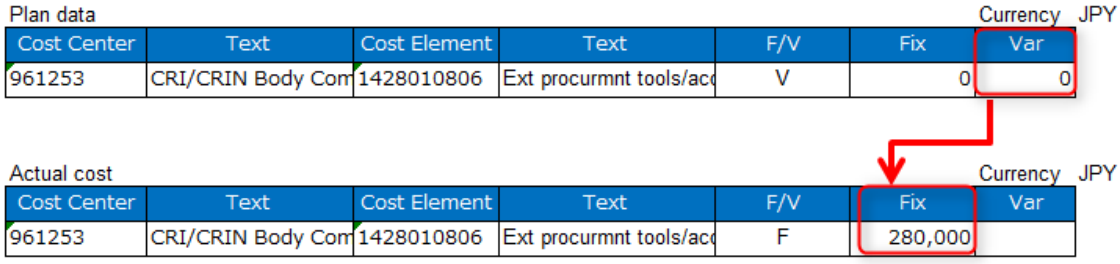


FIGURE 9. The actual costs of a variable CE without plan data is mistreated as fixed costs in SAP

Figure 9 explains more details about the main problem mentioned above. 961253 is a cost center in the manufacturing area (MG) for CRI/CRIN Body Common. It is one of the product classes called Common Rail Injector for Passenger Cars and Commercial Vehicles. 1428010806 is the CE of "External procurement tools/account determination cost". It is a variable cost, but was booked under a different CE in the past. Because of that, the new CE 1428010806, which does not exist in BP15, has no plan cost. Section 3.3 *Cost splitting in SAP* has pointed out when a CE has no plan cost, the system will

automatically treat its actual costs as fixed. It can be seen in figure 9, 280,000 JPY is incurred as the actual “External procurement tools/account determination cost”, and the system has automatically assigned it to fixed costs even though it should be variable costs.

Consequently, at the time being the division has more fixed costs than it should because part of variable costs has been mistakenly recorded as fixed costs. However, the inconsistency of data in the new system does not have any effect on total costs, which are the sum of fixed and variable costs. The team tried to solve the problem so that at least the upcoming months could have the right splitting between fixed and variable costs. At first, the team assigned manually 12 JPY as a whole year plan costs for new CEs that currently have no plan data. However, the actual costs of a variable CE in a certain cost center with 12 JPY of plan data were still mistreated as fixed costs. The questions are why and how it happened. Table 3 provides variable costs budget adjustment and target costs of a CE without plan data.

TABLE 3. Variable costs budget and target costs

		BP15 (Annual)	BP15 (Monthly)	Target cost (Annual)	Target cost (Monthly)
Budget (JPY)	Wrong adjustment	12	1	5.4	0.45
	Right adjustment	24	2	10.8	0.9
Activity unit (hours)		120	10	54	4.5
Activity rate (%)		100	8.33	45	3.75

Activity type is a SAP term that describes the connection between the performance and the source of costs to be reflected as plausible and as source-based as possible. Activity types are used for planning and costing of the overhead costs, which are planned and recorded against cost centers. Some common activity types are operating equipment times (machine-operating time), associate-related time (working time), and performance output quantities (in physical dimensions such as kWh, m^2, m^3), etc. The measurements of an activity type in units and percentages are called “Activity unit” and “Activity

rate"[12]. The activity unit in table 3 is the operating time of the machines to produce a product. A plan activity unit is 120 hours, which is 100% in term of activity rate. However, the actual hours are just 54, which account for only 45% of the operating rate. The target cost in SAP is calculated as adjusted plan cost referring to the actual activity rate. Therefore, once 12 JPY is assigned as annual plan data, SAP calculates target cost by multiplying the plan data to the actual activity rate:

$$Target\ cost\ (Annual) = \ 12\ JPY \times 45\% = 5.4\ JPY$$

SAP continually computes target cost on monthly base by dividing annual target cost for 12 months:

$$Target\ cost\ (Monthly) = \ 5.4\ JYP\ \div 12 = 0.45\ JPY$$

0.5 JPY is the smallest allowed value to be used in SAP. Hence, SAP automatically rounds 0.45 JPY, which is smaller than 0.5 JPY, to 0. Again, the system assumes that CE has no plan data, regardless of the fact that 12 JPY has been added.

The team was not aware of the situation where there might be an activity rate that is lower than 50% as it rarely happens in reality. In case of 50% of operating rate, the monthly target cost is exactly 0.5 JPY. The operating rate, which is lower than 50%, shows up because of reduced production volume of CRI/CRIN. Therefore, the team decided to put 24 JPY as plan data instead of 12 JPY, which would provide more space for flexibility. In addition to that, 24 JPY is also small enough to really have no impact on the total plan cost in BP15. In table 3, the monthly target cost with the right adjustment of 24 JPY is 0.9 JPY, which is greater than 0.5. Figure 10 shows how to get the correct splitting in next month for CE 1428010806 in cost center 961253.

[12] C/AOF. 2015. Unit costing for PPC and SG&A. Internal source.

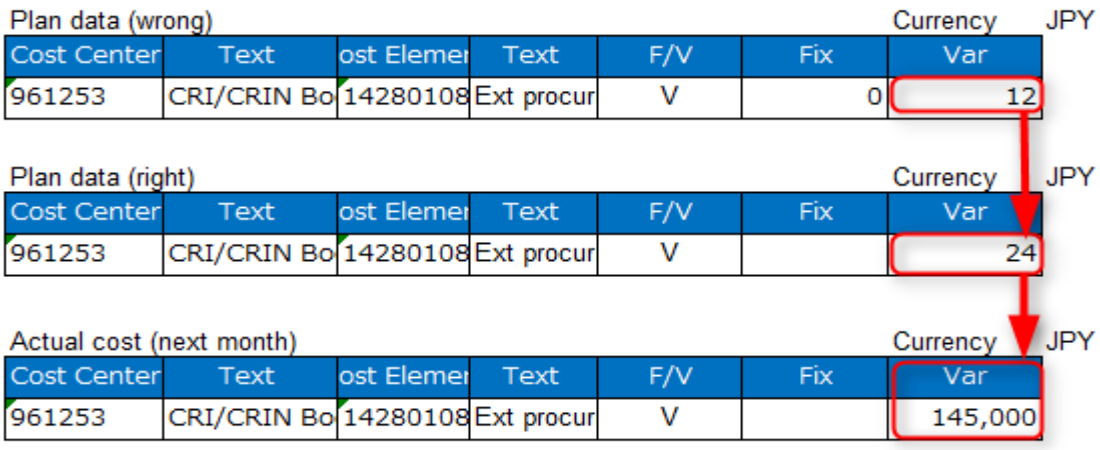


FIGURE 10. New plan data for CE 1428010806 in cost center 961253

Even though the adjustment between 12 JPY and 24 JPY is just a minor problem that arises from the effort of overcoming the major challenge stated in the beginning of the section, it is still necessary to mention here. 24 JPY would be a correction base for any significant mismatches in the future due to the appearance of new CEs. In a cost center, there are two types of CEs, which are fixed and variable. The actual costs of a variable CE without plan data are treated as fixed costs. The immediate result of this is part of actual variable costs are shifted to fixed costs. This is a major drawback preventing the division from deploying SAP to track fixed costs in this fiscal year.

4.2 The suggested solution

In spite of any manual efforts, the mix up between fixed and variable costs in the previous months cannot be changed. Moreover, there are still some new CEs that the team cannot match to the old CEs causing the difficulty to define them whether fixed or variable costs. Consequently, having a fixed costs report out of SAP that provides accurate information for fixed costs tracking in this year 2015 is unattainable. Therefore, the researcher's recommendations are:

- Focusing on correcting the fixed and variable splitting in the system by creating a database of pre-defined concept of fixed and variable costs for future use in 2016.
- At the same time, the research would develop a reporting template for fixed costs tracking to be applied next year when the data in SAP is ready.

- However, the 2015 data in SAP, which would need to be incorporated in the 2016 report as previous data, still remains inapplicable. Therefore, one time effort in the beginning of 2016 is necessary to manually compile the 2015 data to the 2016 fixed costs report. Section 5.3.1 will discuss more about this issue.

The new upgraded SAP system allows the controlling team to extract P/L easily. However, in the past under the old system, the cost centers report had to be prepared in Excel as a base for generating P/L and supporting other internal reporting activities within DS-JP. A fixed costs report, for example, was one of the internal reports derived from the cost centers report. For the purpose of tracking fixed costs of the current year 2015, the team decided to continue creating a cost centers report even though it required a lot of time and manual efforts.

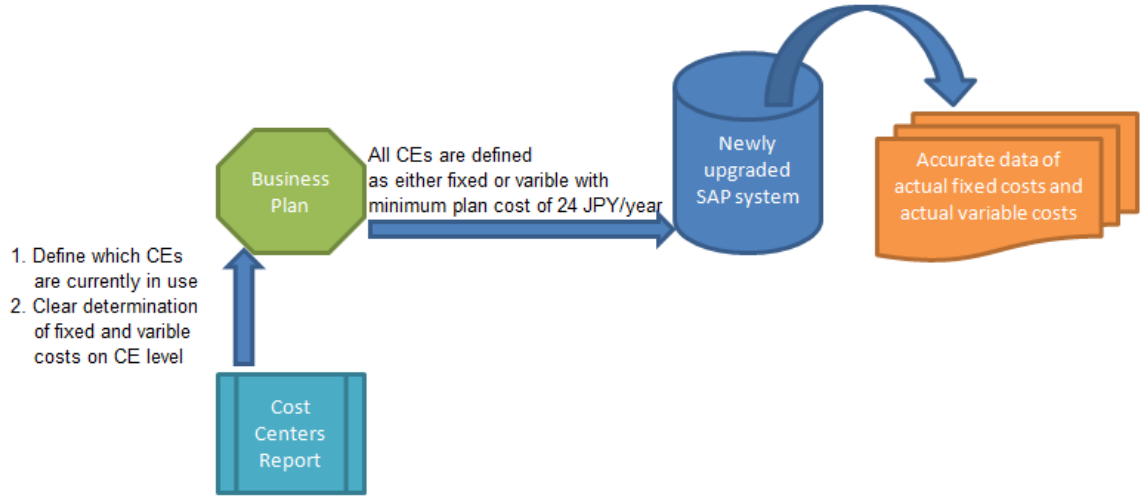


FIGURE 11. The database for correct cost splitting in SAP next year 2016

A cost centers report, which is manually prepared in Excel contains essential information such as organization, department, cost component, cost center, cost element, actual cost, plan cost, last year cost, etc., and the most important feature is a clear determination of fixed and variable costs (see Appendix 1). The cost centers report is not only used to track fixed costs, but also to prepare BP in the following year. As described in figure 11, by looking at the cost centers report the team would know which CEs are currently in use; hence, these CEs would be defined correctly during the business planning of 2016. As a result, there would be no such a mix up of fixed and variable costs as in this year. The possibility of appearing new CEs is quite low in the next year because

BP16 would be planned in September 2015 when YTD08 data would be already available (data from January to August). At that time, BP16 should not miss out any CEs as all of the CEs would have been fixed. If some new CEs show up in the start of 2016, manual adjustment of 24 JPY would be only needed in case those new CEs are variable and have significant actual costs.

To create the cost centers report 2015, a matrix table was made of 410 rows of cost centers and 339 columns of CEs (see Appendix 2). Managerial judgment was the framework for fixed and variable costs splitting. After upgrading the SAP system, the cost patterns have been reconstructed. Meetings of the team members who have been working with cost centers report and who are the key users of SAP, together with the general manager of CFA1 department and the researcher were held frequently to learn about the cost structure in the newly introduced system. By sharing and combining knowledge, experiences, technical skills and past observations of cost relationships, the goal of the meeting was to issue a good managerial judgment and accurate assessment of determining cost behavior. In the matrix table, **F** is represented for fixed costs, **V** is variable costs and **M** is mixed costs that need to be clarified as either fixed or variable.

Due to lack of experience, deep understanding of the division and the previous years' cost structure, along with the Japanese language barrier (the descriptions of many cost centers and CEs were only available in Japanese), the researcher could not involve actively in the discussion of splitting fixed and variable cost. Therefore, in the next section, the researcher will describe the process of cost accounting for a better grasp of how the matrix table was made.

4.2.1 Overview of cost accounting at DS-JP

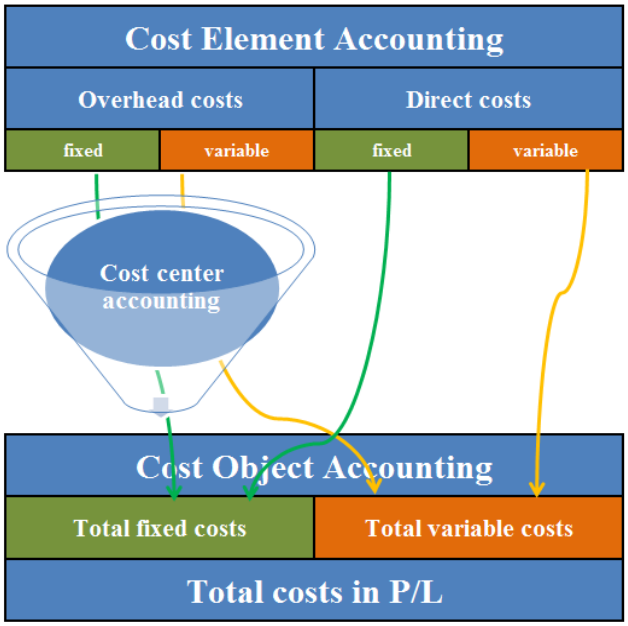


FIGURE 12. The connection of cost accounting and P/L (Unit costing for PPC and SG&A, 2015, internal source, modified)

The diagram in figure 12 displays the connection of cost accounting and P/L. Cost accounting is responsible for recording all the costs incurred that later on would show up in P/L as a total costs. The cost element accounting is the first step in cost accounting. It answers the question: which costs are incurred?, e.g. personnel costs, administration costs, etc. Direct costs (i.e. Material costs) go directly to a cost object while overhead costs are recorded in cost centers. To be more precise, the cost center accounting incorporates the costs of the cost element accounting and accumulates all costs, which cannot be directly assigned to a cost object. Internal activity allocation and definition of activity rates happen within this stage. In the final stage, costs are assigned to cost objects. Cost object unit accounting or also known as unit costing is the allocation of the costs to a cost object unit.

4.2.2 Matrix table of fixed, variable and mixed costs

Total costs in P/L consist of two main components that are manufacturing costs of sales, which also known as APC (Actual Product Costs), and SG&A (Selling, General and Administration). Figure 13 describes the components of total costs in P/L.

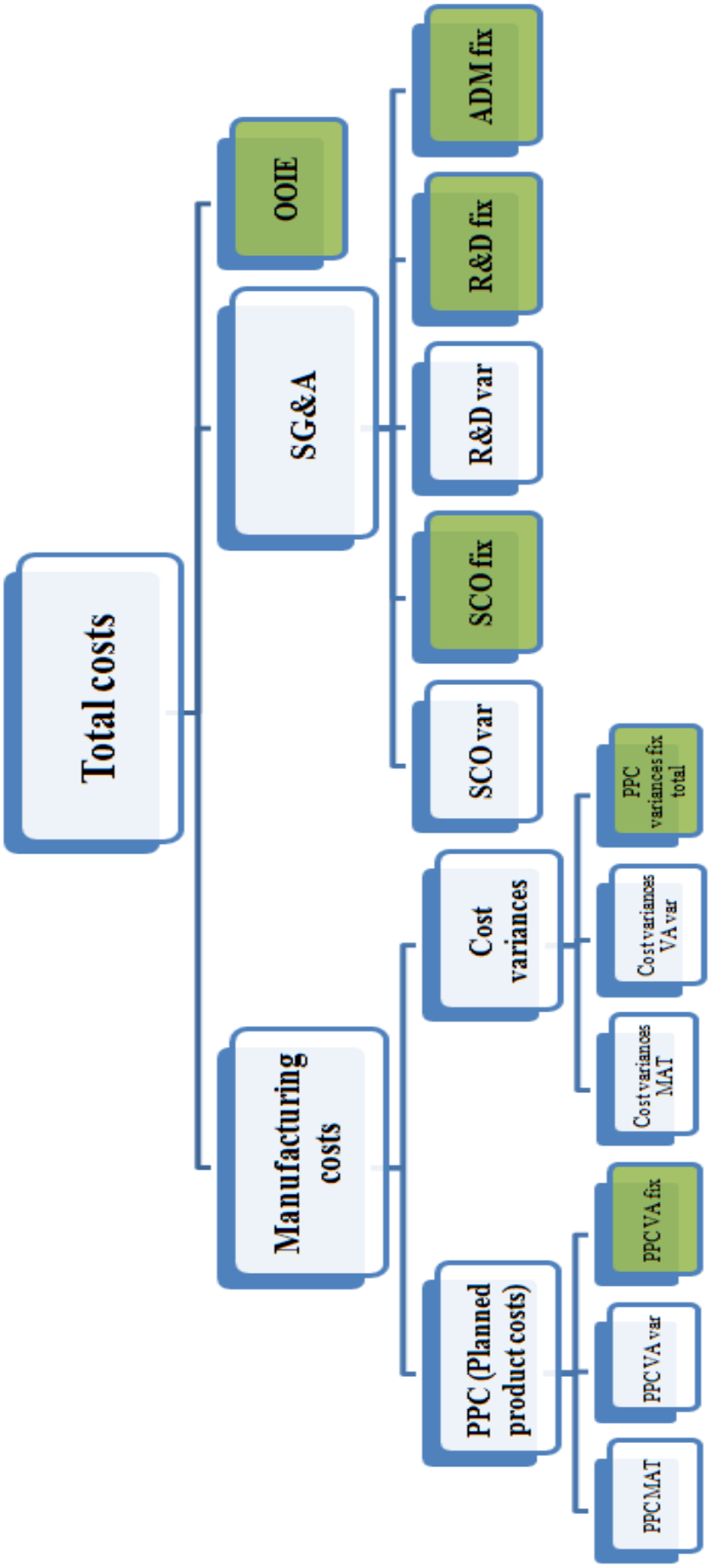


FIGURE 13. Total costs' components in P/L

The manufacturing costs of sales include PPC and cost variances from productions costs. Generally speaking, material costs (PPC MAT) and PPC value added variable costs (PPC VA var) make up variable PPC. Sum of fixed value added PPC (PPC VA fix) and variable PPC is PPC total. Cost variances show the differences between the total costs of a certain period and the overall performance for the period evaluated at PPC. In P/L, PPC variances are split to PPC variances MAT prices (Cost variances MAT), PPC variances of value added variable costs (Cost variances VA var) and PPC variances fixed total. Manufacturing costs in P/L, to be more precise, APC are the sum of PPC and cost variances.

Costs that are incurred by sales, administration and general operating expenses are called SG&A. The main components in SG&A are selling variable and fixed costs (SCO var, SCO fix), research and development variable and fixed costs (R&D var, R&D fix), and administration fixed costs (ADM fix). Unlike PPC, there is no differentiated disclosure of SG&A variances for actual and plan data.

The last component of total costs in P/L is OOIE (Other Operating Income and Expense) coming from the disposal of assets from property, plant, and equipment and intangible assets, results of profit and loss transfer agreement with affiliated companies, etc. For instance, if assets are sold or scrapped prior to the end of their useful life, special internal depreciation (special ID) may be determined for different residual book values in internal and external accounting[13]. For the purpose of tracking fixed costs that facilitate operational control of the actual production process of goods and services, fixed costs derived from P/L, which are marked as green boxes, but excluding OOIE in figure 13, are the main targets of the new fixed costs reporting concept.

[13] C/AOR. 2015. Internal reporting. Internal source.

PROFIT AND LOSS STATEMENT	HFM-Account / Value field	Description
Quantity in pieces		
Sales to third parties (STP)	S310000	Sales to third parties (STP)
Internal sales (RB group)	S320000	Internal sales total
t/o DS-JP internal w/o TA		
Internal deliveries (RBJP internal)	S330000	Internal deliveries
Total net sales (TNS)	S300000	TNS (Total Net Sales)
PPC MAT	P101110	PPC MAT (Planned product costs material)
PPC VA var	P101120	PPC var others (Planned product costs variable others)
PPC VA fix	P101200	PPC (Planned product costs) fixed
PPC total	P101000	PPC (Planned product costs) total
GM1	P910000	GM 1 (Gross margin o.PPC/cost of sales)
Cost variances MAT	P121100	PPC variances MAT prices
Variances cost objects var	VVR52	Variances cost objects var
Variances prod. overhead costs var	VVR54	Variances prod. overhead costs var
Subcon costs var	VVRA9	IFRS-addition production costs var
Variance others var	Delta	
Cost variances VA var	P121200	PPC variances variable others
Variances cost objects fix	VVR53	Variances cost objects fix
Variances prod. overhead costs fix	VVR55	Variances prod. overhead costs fix
t/o CUV fix	P123100	CUV fix (Capacity utilization variance fixed)
IFRS-addition production costs fix	VVRB0	IFRS-addition production costs fix
Variance others fix	Delta	
PPC variances fix total	P123000	PPC variances fixed total
PPC variances total	Sum	
GM2	P920000	GM 2 (Gross margin over total product cost)
VVR56 Transportation	VVR56	Transportation
VVR57 Packaging	VVR57	Packaging
VVR58 General sales overhead var (warehousing / dispatch)	VVR58	General sales overhead var (warehousing / dispatch)
VVR59 Allowance received logistic costs var	VVR59	Allowance received logistic costs var
VVR60 Commissions	VVR60	Commissions
VVR61 External failure costs (warranty/goodwill/accruals)	VVR61	External failure costs (warranty/goodwill/accruals)
VVR62 Allowance received external failure costs	VVR62	Allowance received external failure costs
VVR63 Capital costs receivables 3rd parties (CO-OM)	VVR63	Capital costs receivables 3rd parties (CO-OM)
VVR64 Capital costs stock (CO-OM)	VVR64	Capital costs stock (CO-OM)
VVR65 Non-interest bearing dept sales var	VVR65	Non-interest bearing dept sales var
VVR66 Sales samples var	VVR66	Sales samples var
VVR67 Other sales costs var	VVR67	Other sales costs var
SG&A sales var	P213100	SCO var (Selling costs variable)
VVR69 General sales overhead fix (storage, shipping)	VVR69	General sales overhead fix (storage, shipping)
VVR71 Scrapping	VVR71	Scrapping
VVR70 Allowance received logistic costs fix	VVR70	Allowance received logistic costs fix
VVR72 Costs sales depts. customer related	VVR72	Costs sales depts. customer related
VVR73 Costs sales depts. product related	VVR73	Costs sales depts. product related
VVR74 External sales and distribution costs(TV und RG)	VVR74	External sales and distribution costs(TV und RG)
VVR75 Sales samples fix	VVR75	Sales samples fix
VVR76 Advertising/fairs/sales promotion	VVR76	Advertising/fairs/sales promotion
VVR77 Allowances received advert./fairs/promotion	VVR77	Allowances received advert./fairs/promotion
VVR78 Consumer-services	VVR78	Consumer-services
VVR79 Free-of-charge deliveries	VVR79	Free-of-charge deliveries
VVR80 Other allowances received	VVR80	Other allowances received
SG&A sales fix	P213200	SCO fixed (Selling costs fixed)
VVR68 Licences	VVR68	Licences
SG&A develop var	P223100	R&D var (Research and development costs variable)
VVR81 Basic development	VVR81	Basic development
VVR82 Platform development	VVR82	Platform development
VVR83 Component projects	VVR83	Component projects
VVR84 Derivation projects	VVR84	Derivation projects
VVR85 Series-support projects	VVR85	Series-support projects
VVR86 Acquisition projects	VVR86	Acquisition projects
VVR87 Development infrastructure	VVR87	Development infrastructure
VVRA7 Patent costs	VVRA7	Patent costs
VVR88 FV-assessment external GB-systems	VVR88	FV-assessment external GB-systems
SG&A develop fix	P223200	R&D fix (Research and development costs fixed)
VVR89 Administration departments	VVR89	Administration departments
VVR90 Z-assessment admin. external GB-systems	VVR90	Z-assessment admin. external GB-systems
VVR91 Other administration costs	VVR91	Other administration costs
VVR92 Non-interest bearing dept admin. fix	VVR92	Non-interest bearing dept admin. fix
SG&A admini fix	P233200	ADM fixed (Adminstration costs)
SG&A total	P203000	Total costs SG&A
VVR93 Other operating expenses	VVR93	Other operating expenses
VVRA8 Other operating income	VVRA8	Other operating income
Internal depreciation for Goodwill/EKA	P956100	in OVC included GW/FCA-costs of CC and ID
Capital charge for Goodwill/EKA	P956100	in OVC included GW/FCA-costs of CC and ID
Other operating expenses and income	P300000	OOIE (Other operating income / expenses)
OVC (operating value contribution)	P950000	OVC (operating value contribution)
OVC%oS	P950001	OVC as % of TNS
VVR96 Commercial depreciation	VVR96	Commercial depreciation
VVR97 Internal depreciation	VVR97	Internal depreciation
Reconciliation of ID	Sum	
VVR98 Capital charges fixed assets	VVR98	Capital charges fixed assets
VVRB7 Capital charge inventories	VVRB7	Capital charge inventories
VVRB8 Capital charge trade receivables third party	VVRB8	Capital charge trade receivables third party
VVRB9 Capital charge credits trade payables third party	VVRB9	Capital charge credits trade payables third party
VVRC0 Capital charge credits customer prepayments	VVRC0	Capital charge credits customer prepayments
Reconciliation of CC	Sum	
Reconciliation of special CC	VVRC1	special capital charge
Financial results and others	VVRB6	Financial results and others
Extraordinary result	VVRA2	Extraordinary result
IFRS EBIT	P870000	EBIT (Earnings before interest and taxes)
Financial results	VVRA1	Financial results
IFRS EBT	P970000	EBT (Earnings before tax)

FIGURE 14. Internal P/L statement with description of respective value fields (P/L, modified)

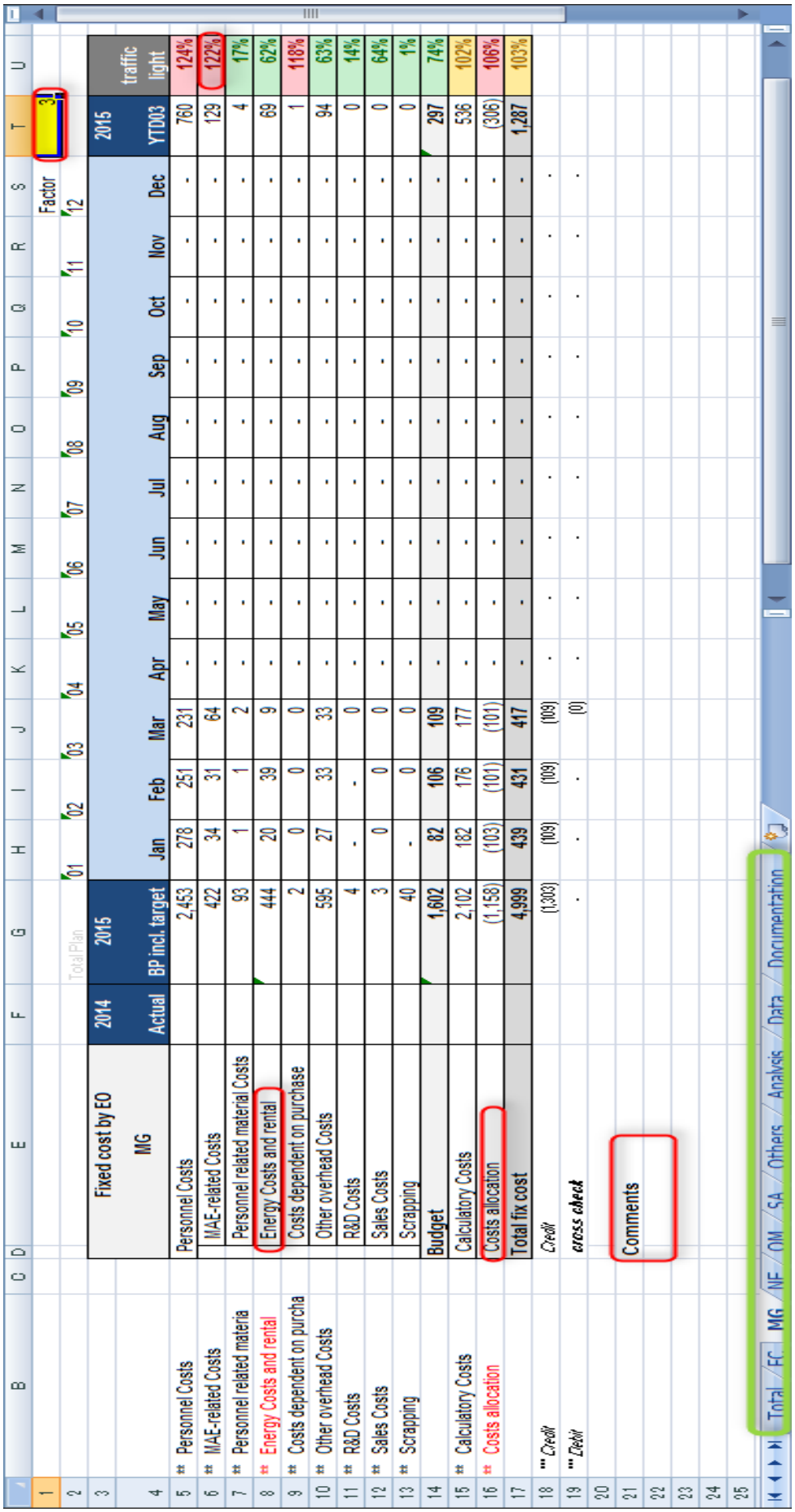
Behind each category such as SCO var, SCO fix, etc., there are sub-sets called value fields and are indicated with VVR. For example, SCO fix includes a wide variety of value fields such as general sales services (warehouse, dispatch), allowance received logistics costs, external sales and distribution costs, etc. (see figure 14). The costs in these value fields are all fixed. Similar to R&D and ADM, there is a clear classification of which value fields are fixed and which ones are variable. In line with the new cost structure in SAP system, all cost centers in SG&A area are assigned directly to certain value fields. Therefore, it is very simple to have a differentiation of fixed and variable cost centers in SG&A area. In the matrix table, any cost centers belonging to cost center type of **SG&A fix** are all treated as fixed cost. Thus, the whole row was labeled with **F**. In contrast, cost centers that belong to **SG&A var** were labeled with **V**; no **M** should be seen in SG&A area. However, in case of PPC where there is no such a clear classification and cost assignment as in SG&A, it required the discussion from associates and coordinators to distinguish fixed and variable costs.

The matrix table was the final result gained from the team meetings, in which all cells are filled and as less **M** left as possible. Next step was to create a cost center report based on the matrix table. Any **M** left would be decided in the meetings based on the sharing of knowledge among the team members, and reviewing of the actual data in SAP as well as the plan data in BP15. The completed cost centers report should only contain **F** and **V** (see Appendix 1).

5 A TEMPLATE FOR FIXED COSTS REPORT

5.1 The design of fixed costs report in Microsoft Excel

Creating a comprehensive report of fixed costs by EO (see figure 1) on cost center level is the main objective of this thesis. The structure of the report was carefully designed to meet the needs of the division. The report was designed in Excel including ten spreadsheets. There are separate spreadsheets for each EO, i.e. **FC, MG, NE, QM, SA,** and **Others**. Even though DGS-ES/RBU-JP also belongs to DS-JP, its costs are recorded against only one cost center. Therefore, its costs are reported together with DS/NE-JP (spreadsheet named **NE**). **Others** comprise RP and CP which are not the organizational units within DS-JP. However, they have costs related to DS-JP. RP stands for Regional President. Salaries, travelling costs, etc. of the top-executives in DS-JP are posted in a cost center under the cost center group of RP. Whereas Central Purchasing (CP) is responsible for some specific activities in DS-JP, incoming inspection is an example. As a result, RP and CP have costs posted via DS-JP's cost centers. This is a reason why they are included in terms of costs reporting. The **Total** spreadsheet draws the whole picture of fixed costs across functions. By utilizing PivotTable in Excel, **Analysis** spreadsheet is a mean to dig for details. The last spreadsheet in the report is **Documentation** which consists of process descriptions, highlighting areas for notification and collection of tips that would save time in updating the report every month. To sum up, **Total**, **FC**, **MG**, **NE**, **QM**, **SA** and **Others** spreadsheet are meant to report fixed costs to managers; whereas **Analysis**, **Data** and **Documentation** are supporting spreadsheets used by a cost analyst for the updating and interpreting of the report.



Fixed cost by EO MG	2014 Actual	2015 BP incl. target	'01 Jan	'02 Feb	'03 Mar	'04 Apr	'05 May	'06 Jun	'07 Jul	'08 Aug	'09 Sep	'10 Oct	'11 Nov	'12 Dec	2015 YTD03	traffic light
Personnel Costs		2,453	278	251	231	-	-	-	-	-	-	-	-	-	760	124%
MAE-related Costs		422	34	31	64	-	-	-	-	-	-	-	-	-	129	122%
Personnel related material Costs		93	1	1	2	-	-	-	-	-	-	-	-	-	4	17%
Energy Costs and rental		444	20	39	9	-	-	-	-	-	-	-	-	-	69	62%
Costs dependent on purchase		2	0	0	0	-	-	-	-	-	-	-	-	-	1	118%
Other overhead Costs		595	27	33	33	-	-	-	-	-	-	-	-	-	94	63%
R&D Costs		4	-	-	0	-	-	-	-	-	-	-	-	-	0	14%
Sales Costs		3	0	0	0	-	-	-	-	-	-	-	-	-	0	64%
Scrapping		40	-	0	0	-	-	-	-	-	-	-	-	-	0	1%
Budget		**1,602**	**82**	**106**	**109**	-	-	-	-	-	-	-	-	-	**297**	**74%**
Calculatory Costs		2,102	182	176	177	-	-	-	-	-	-	-	-	-	536	102%
Costs allocation		(1,158)	(103)	(101)	(101)	-	-	-	-	-	-	-	-	-	(306)	106%
Total fix cost		**4,999**	**439**	**431**	**417**	-	-	-	-	-	-	-	-	-	**1,287**	**103%**
Credit			(1,303)	(109)	(109)	-	-	-	-	-	-	-	-	-		
cross check			-	-	(0)	-	-	-	-	-	-	-	-	-		

Comments

Total / FC / MG / NF / OM / SA / Others / Analysis / Data / Documentation

FIGURE 15. MG's fixed costs tracking - a screenshot of the **MG** spreadsheet

Figure 15 illustrates how the fixed costs tracking spreadsheet for a certain EO looks like. The tracking spreadsheets of each EO share the same layout, which all have the same categories as in SAP:

** Personnel Costs: such as remuneration, compensation for overtime, bonus, cost of retirement benefits and other personnel costs.

** MAE-related Costs: this is machinery and equipment related costs covering the costs of maintenance, tools and workshop consumption.

** Personnel related material Costs: travel costs, entertainment expenses, vocational training, occupational personnel-oriented material costs.

** Energy Costs and rental: procurement of energy and fuels, rent for land and buildings.

** Costs dependent on purchase: it is the costs depend on the purchase of goods like custom duty, freight.

** Other overhead Costs: communication and IT costs, insurance, taxes (independent of the income), public relations, consulting expenses, rent and leasing for MAE - vehicles, and other costs.

** R&D Costs: Research and development costs, development sample costs.

** Sales Costs: advertising, warranty, outgoing freight and commission.

** Scrapping: the elimination of finished goods and merchandise from the inventory; for example, the removal of materials, parts, and products in the event of changes to or cancellation of orders by customers.

** Calculatory Costs: this group comprises capital charge of fixed asset and internal depreciation.

** Costs allocation: received overhead costs, allocation of overhead costs, automated overhead allocation.

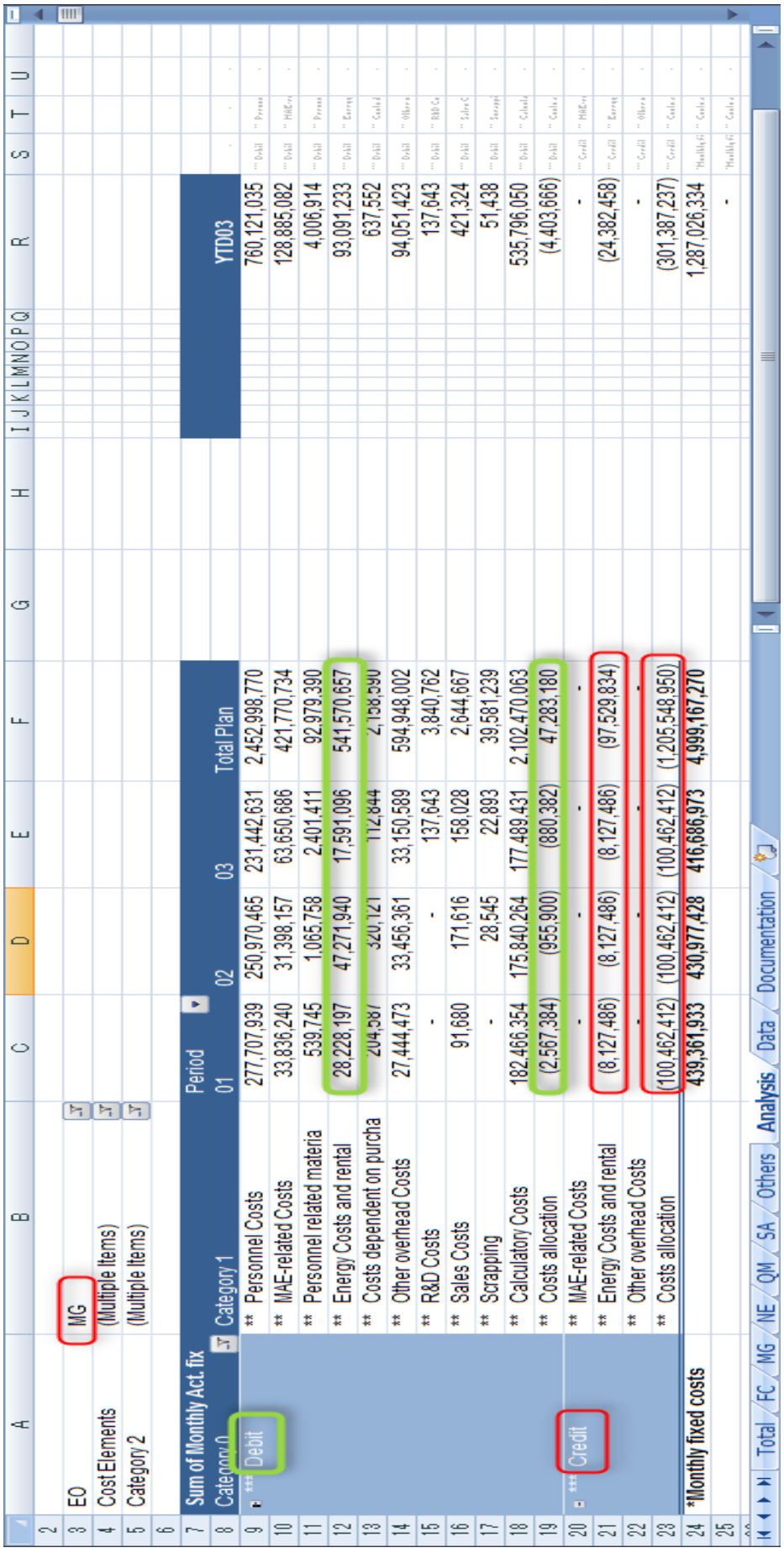


FIGURE 16. Debit/Credit offset in MG - a screenshot of the **Analysis** spreadsheet

The researcher inputted Excel formulas throughout the year for each fixed costs tracking spreadsheet. The figures in **FC, MG**, etc., spreadsheet will be automatically shown up with no need of manual work once the **Data** spreadsheet is updated by downloading the data from SAP. Some EO might not have all the listed categories above, an example for this is **NE,** which doesn't have "Scrapping" group. Therefore, the value in the missing groups is automatically turned to zero. Lying above the ***Comments*** section is the ***cross check*** row (see figure 15). The researcher applied mainly *Vlookup* formula assuming the perfect condition, where there is no *Debit/Credit offset*, or where there is no *Credit* part that could be found in the database. If that condition is met, the figures in ***cross check*** row should be zero. However, as shown in figure 16, "Energy Costs and rental" and "Cost allocation" are both debited and credited. Thus ***cross check*** row in **MG** spreadsheet would show the value that is different to zero. By looking at ***cross check***, one can recognize a sign of *Debit/Credit offset* special case. The action should be taken is switching to **Analysis** spreadsheet to see which categories/groups are credited. As mentioned above in this case, they are "Energy Costs and rental" and "Cost allocation". Highlighting these groups in **MG** spreadsheet for later investigation, the cost analyst then needs to put some manual efforts to make ***cross check*** equal to zero by altering the Excel formula in "Energy Costs and rental" and "Cost allocation" row from *Vlookup* to *Sumif*. In figure 15, the formula in row 8 and 16 have been adjusted; thus, values in row 19 (***cross check)*** are all equal to zero.

As presented in figure 15, cell T1 is the factor used to calculate the percentage in the ***traffic light*** column. For instance, in April the management board wants to have the fixed costs report of the previous months (January, February and March). The cost analyst would get data of the first three months in SAP and incorporate them in **Data** spreadsheet. The column of each single month is linked to the base data. As a result, figures are shown up in column H, I, J (***Jan, Feb, Mar***) once updating the data source. For this reason, the ***Factor*** in T1 is the number of recent relevant months, in this case cell T1 = 3. ***YTD*** column is the cumulative sum of all the monthly costs that are available by the time the report is made. The percentage in the ***traffic light*** column is calculated by:

$$\left(\frac{YTD}{Factor} \times 12\right) \div BP\ incl.target \times 100\%$$

The computation gives the cost analyst an insight about the future forecast and answers the critical question: if the organization/department is going to keep up with this trend of fixed costs incurring, would it be over the budget limit when reaching to the end of the financial year? Therefore, the ***traffic light*** is created to catch attention of managers and cost analysts. Conditional formatting is used with $\pm$ 5% is allowed for variances when setting the colors of the ***traffic light***. If the results of the above computation are greater than or equal to 100%+5% (or $\geq$105%), they are marked with red. If the results are less than or equal to 100%−5% (or $\leq$95%), mark them as green. Lastly, if they are in the range of 95% and 105%, mark them with yellow. The cost analyst would focus on red light because it has the highest possibility of exceeding the budget. The **Analysis** spreadsheet aims for further investigation by answering the questions about how the actual fixed costs are currently distributed, where the problems are, and how to improve. The findings should be written down on the ***Comments*** section to inform the management board accordingly.

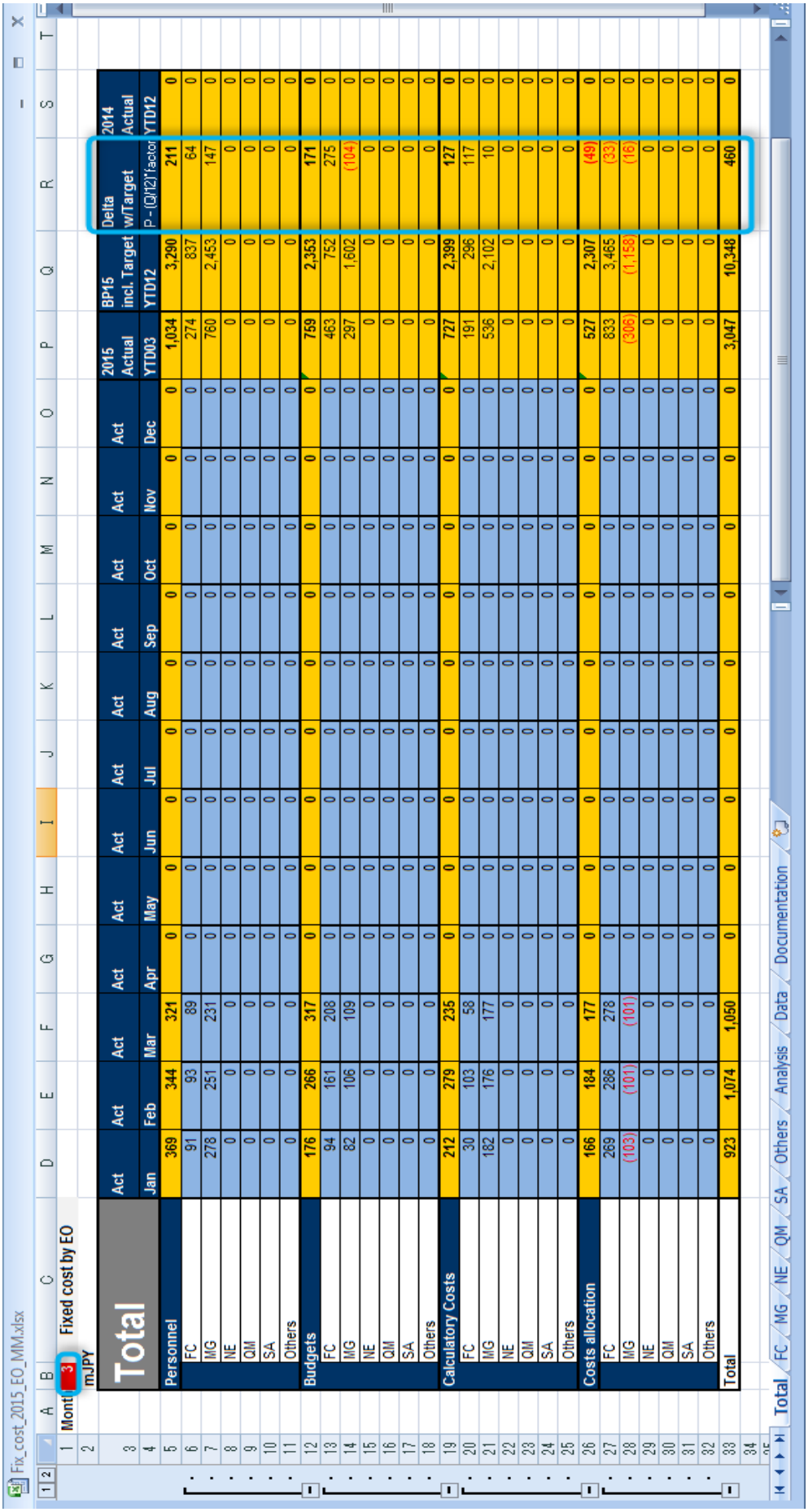


FIGURE 17. Screenshot of the **Total** spreadsheet

Total spreadsheet linked to reporting results of each EO, shows the whole picture of total fixed costs in DS-JP. In figure 17, cell B1 ***Month*** is actually the ***Factor*** located in cell T1 (see figure 15) explained above. It is used to calculate ***Delta with Target*** in column R:

$$2015\ Actual\ YTD - \left(\frac{BP15\ incl.target}{12} \times factor\right)$$

The logic behind this formula is quite similar to ***traffic light***; however, ***traffic light*** is expressed in annual percentage; whilst ***Delta with Target*** shows absolute data on YTD base.

By avoiding an overabundance of unnecessary financial measures, the ***traffic light*** and the ***Delta with Target*** are the core measures to observe the trends of the expenses being incurred over the course of the year. Together with the ***Comments*** section and the way of the report is organized, this fixed costs report will help managers track fixed costs efficiently and comprehensively by not only providing the whole picture, but still accessible for deeper analysis if needed.

5.2 Testing

Regarding to section 4.2.1, both total fixed and variable costs are displayed in P/L. Cost center accounting is used to absorb overhead costs that cannot be directly assigned to cost objects (see figure 12). From a total costs point of view, costs displayed in cost centers are part of total costs in P/L besides direct costs. The new reporting concept in this thesis aims to capture fixed costs on cost center level; or in other words, only fixed overhead costs would be reported. As a result, the new fixed costs reporting concept cannot display one hundred percent of total fixed costs shown in P/L. Nevertheless, the question is what is the percentage of total fixed costs that the new concept can cover?

In the testing section, the researcher applied quantitative method to test the applicability of the new concept. P/L is the base for comparison. The ratio could be easily found by dividing the amount of fixed costs in the new reporting concept to the amount of total

fixed costs in P/L. However, the inconsistency of fixed and variable costs in SAP does not allow the author to compare directly. In details:

- More fixed costs in SAP than it should have.
- As a consequence, data of total fixed costs and total variable costs in P/L are not authentic even though total costs are valid. The controlling team is manually adjusting the data in P/L throughout 2015.

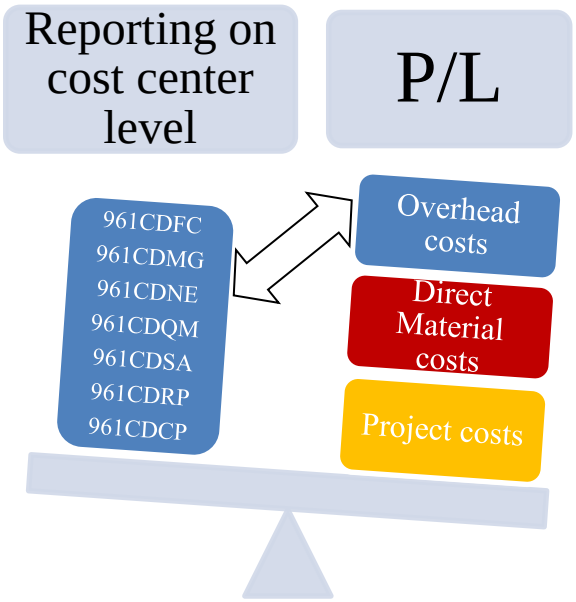


FIGURE 18. Relationship of reporting on cost center level and P/L

Figure 18 shows that reporting on cost center level can only absorb the amount of overhead costs in P/L. Direct material costs and part of costs related to projects (R&D costs) are missing. 961CDFC, 961CDGM, etc. are cost centers groups of each EO, in which total overhead costs are recorded. In relation to a specific internal controlling objective, not all cost groups in P/L are the main interests of the team. According to the controlling team, the costs posted via cost centers mainly account for costs that matter to the internal controlling target. Therefore, the new reporting concept based on cost center level is expected to cover most of total fixed costs in P/L even though not one hundred percent. Getting back to the main question in the beginning of the section, what is the percentage of total fixed costs that the new concept can cover? The answer for it should be shown in a numerical data. Concerning the fact of not being able to find the coverage percentage directly, the researcher came up with a new way to calculate the coverage ratio regardless of the fixed and variable mixing up situation. Please note that due to confidentiality reasons, none real data is disclosed here. The figures presenting in table

3 and table 4 have been modified based on the real data obtained from SAP and from the division's P/L over the years. However, the modified data does not have any impact on the final result of the testing.

Let denote F' and V' as the fixed costs and variable costs recorded against cost centers. F is the total fixed costs in P/L without OOIE as what have been explained in section 4.2.2. Besides that, V is the total variable costs, but excluding Direct Material costs (PPC MAT and Cost variances MAT) in P/L. Direct Material costs are not considered because they are variable costs that have major portion in P/L but are not the main focus of the controlling team. The data of Direct Material costs is applicable because they are direct costs assigned directly to a cost object.

According to figure 18:
Total overhead costs = F' + V'
Total fixed costs in P/L = F (consisting of fixed portion of the project costs)
Total variable costs in P/L = Direct Material costs + V (including variable project costs)
Total costs in P/L = F'+V'+ Direct Material costs + Project costs = F + V + Direct Material costs.

The vital concern is finding the ratio of $\frac{F'}{F}$. This is the percentage of total fixed costs that the new reporting concept can cover. The mix up of fixed and variable costs in the system does not affect to total costs and direct costs posting. Therefore, the idea is to find the ratio of $\frac{F'+V'}{F+V}$ and then deriving to $\frac{F'}{F}$.

TABLE 4. Calculation of ratio $\frac{F'+V'}{F+V}$

2015	Million JPY	YTD05
	FC	2,931
+	MG	5,389
+	SA	321
+	QM	377
+	NE	786
+	CP	9
+	RP	57
Total Overhead costs: F'+V'		9,870
	PPC total	[illegible]
+	PPC variances total	[illegible]
+	SG&A total	[illegible]
-	PPC MAT	[illegible]
-	Cost variances MAT	[illegible]
Total costs excluding Direct Material costs: F+V		10,475
Ratio $\frac{F'+V'}{F+V}$		0.94

Referring to figure 14, sum of PPC total and PPC variances total are APC. Total costs in P/L are the sum of APC and SG&A. Table 4 provides the latest information of total costs from January to May in 2015. Although the ratio $\frac{F'+V'}{F+V}$ changes every month, YTD data that displays the information from the beginning of the year to the present day, is supposed to show the latest as well as the fairest measurement of the ratio. Thereby, instead of using the average ratio of the current five months (from January to May), the author chose YTD05 as a base to compute $\frac{F'+V'}{F+V}$. The result in Table 4 means that in terms of total costs, reporting on cost center level can cover approximately 94% of costs that matter in P/L. The 6% left could include both fixed and variable costs. The following equation explains the aforementioned statement:

$$\frac{F'+V'}{F+V} = 0.94$$

$$\Leftrightarrow F'+V' = 0.94(F+V)$$

$$\Leftrightarrow (F'+V') + 0.06(F+V) = F+V (*)$$

Starting from (*), the most optimal case happens when 6% mentioned above includes only variable costs:

$$V' + 0.06(F + V) = V\ (**)$$

From (*) and (**):

$F' = F \Leftrightarrow \frac{F'}{F} = 1$. Alternatively, the new concept can display 100% of total fixed costs in P/L (1).

In contrast, the least favorite case would happen when 6% of total costs excluding Direct Material costs that the new concept misses are all fixed costs:

$$F' + 0.06\ (F + V) = F\ (***)$$

From (*) and (***):

$$F' = 0.94F - 0.06V \Leftrightarrow \frac{F'}{F} = 0.94 - 0.06\frac{V}{F}$$

Let denote $\alpha = \frac{V}{F}$, the above equation is equal to:

$$\frac{F'}{F} = 0.94 - 0.06\alpha\ (****)$$

The ratio of $\frac{F'}{F}$ is dependent on alpha. As the present data of fixed and variable costs is not applicable, the researcher obtained data from the last three years to observe the trend of how F and V were proportionally related in the past.

TABLE 5. Calculation of the past three years' alphas

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	F	1,475	1,356	1,383	1,434	1,446	1,520	1,505	1,331	1,176	1,423	1,332	1,496
	V	1,157	1,055	1,003	1,061	1,137	1,129	1,189	1,015	965	1,011	955	885
	α	0.784	0.778	0.725	0.740	0.786	0.742	0.790	0.762	0.821	0.710	0.717	0.591
2013	F	1,229	1,150	1,305	1,331	1,230	1,316	2,326	1,220	1,296	1,199	1,253	1,080
	V	970	762	901	953	957	924	1,042	857	834	841	737	1,305
	α	0.790	0.663	0.690	0.716	0.778	0.702	0.448	0.703	0.643	0.701	0.588	**1.208**
2014	F	1,053	1,205	1,227	1,240	1,178	1,330	1,340	1,330	1,229	1,236	1,416	2,390
	V	997	1,030	1,038	1,039	1,032	1,128	1,195	1,106	1,106	1,093	1,051	924
	α	0.947	0.855	0.846	0.838	0.876	0.848	0.892	0.832	0.900	0.884	0.742	0.386

For the purpose of simplicity, table 5 provides the results of alphas. The fluctuating trend of alpha is the outcome of the fixed and variable costs reallocation in 2014, in preparation for the go-live of the new SAP system. Regarding to the equation in (****), the higher alpha is, the lower the coverage ratio of $\frac{F'}{F}$ is. The highest alpha throughout the past three years was 1.208. In the context of the least optimal case, the highest alpha should be substituted into the equation (****) in order to find the lowest possible coverage ratio that the new concept can offer.

Substituting $\alpha = 1.208$ to (****):

$$\frac{F'}{F} = 0.94 - 0.06 \times 1.208 = 0.87, or\ 87\% \quad (2)$$

From (1) and (2), the percentage of total fixed costs that the new reporting concept can cover is: $87\% \leq \frac{F'}{F} \leq 100\%$.

Concerning the real situation, the amount of costs that could not be absorbed by cost centers is both fixed and variable. Therefore, it is very less likely for the most optimal and the least optimal case happen. That is to say, the coverage percentage of the new fixed costs reporting concept would be in the range of 87% and 100%, in which 87% is the lower limit and 100% is the upper limit of the new concept:

$$87\% < \frac{F'}{F} < 100\%$$

Nevertheless, the defined interval above cannot guarantee that the coverage percentage would be in that range. Only the direct method of dividing the amount of fixed overhead costs to the amount of total fixed costs in P/L could provide the most exact numerical testing result. The researcher came up with an indirect way that has certain limitation to test the new concept. It can be seen from the testing process that the coverage ratio depends on the ratio of $\frac{F'+V'}{F+V}$ and alpha, which both change over time. However, by using the latest YTD05 data and the highest alpha in the past, the temporary testing result can be considered as the most accurate estimation of the new fixed costs reporting concept's applicability for the time being.

Being part of the testing process, a bridge between the new fixed costs reporting concept and the base of the comparison has been built by identifying the CEs presenting in both cost centers and P/L. Due to the scope of the thesis, the full list of those CEs will not be disclosed. The finding has generally revealed that in terms of total costs, reporting on cost center level cannot attain some types of costs such as warranty, license fees, and sample development, etc.

5.3 Guidelines/tips

5.3.1 SAP transaction codes with two different approaches

The fixed costs report needs to fulfill two basic requirements, which captures fixed costs only and on monthly base. There are two transactions codes that can be used to extract the data from SAP; however, they both have pros and cons.

The first transaction code is **/n/rb04/yc2_yivp.** It presents the actual costs of every month and total plan costs on cost center level. Furthermore, it allows comparison between the current year and previous year. Nevertheless, the actual costs of every single month are the total costs including both fixed and variable costs. To obtain the fixed costs solely, the cost analyst has to handpick for cost centers that have only fixed costs. By entering these fixed cost centers to the aforementioned transaction code, only fixed costs would be shown on a monthly base. However, there is no such a thing called fixed cost center only or variable cost center only. Cost center itself is a cost collector that

defines the location of where the costs are incurred. In case of DS-JP, cost centers are assigned directly to the value fields of SG&A, where there is a clear verification of fixed and variable costs. As a consequence, those cost centers only have either fixed or variable costs. In general, a cost center would have mixed costs because there are variable costs incurred on the baseline of fixed costs to support the department's activities. Especially in PPC, the costs are classified based on specific requirements and setting rules. The researcher identified the ranges of cost centers containing fixed costs. FC and MG have cost centers that contain both fixed and variable costs (see Appendix 3). If using this transaction code with the range has already been defined, all fixed costs in FC and MG will be reported together with part of variable costs. Not mentioned yet, the approach based on the pre-defined range of cost centers containing fixed costs is not the best solution due to the risk of appearing new cost centers. In case the division decides to produce a new product, a new cost center for that product will be created for DS/MG-JP. A technical cost center, which is not aiming at any certain organizational unit, can be created to serve the particular needs of recording costs as well. Therefore, the cost analyst has to be always cautious and check whether there are new cost centers or not, which after all would result in more manual works.

The other option is using transaction code **y01k_ysis**, where actual costs and plan costs are split into fixed and variable. However, it only shows the YTD data, not on a monthly base. The transaction code also does not offer the ability to compare with the last year's data as the first one. Nevertheless, by using this transaction code, one just needs to enter the cost center group of each respective EO to see the total costs, which are split to fixed and variable portion separately. In case there is the presence of new cost centers, they must be accordingly assigned to a certain EO; or in other word, to a certain cost center group. As a result, this approach will report all the cost centers of a specific EO eliminating the risk of missing new cost centers in the future. Furthermore, there is no manual effort needed for handpicking cost centers including solely fixed costs, but there is a need to review cost center groups once a year. Any changes in organizational structure might lead to the changes in the cost center groups. An example for this is DGS-ES/RBU-JP that can be found in step 4 of section 5.3.2. The demand for the monthly fixed costs data would be easily met by adjusting the selection criteria of ***From period*** and ***To period*** when executing the transaction. The upcoming section will ground on how to download data from SAP. Concerning the data of previous year that needs to be incorporated in the report (column F, figure 15), the researcher suggests to

link it to the last year's report, instead of downloading data from SAP. The division would apply the new concept starting next year. From 2016 point of view, the data of previous year is 2015, which would not be valid anyway due to the current wrong splitting in the system. Therefore, the team needs to make the one and only manual effort in the beginning of 2016 by linking it to the cost center report of 2015. Starting from 2017, the previous year data can be easily included by simply linking to or copying from the fixed cost reports in 2016. The column T in figure 15 that is the YTD data of the current year would be the previous year data of the next year report.

To sum up, by considering both pros and cons of the two transaction codes, the author recommends using the second option that is **y01k_ysis** with the approach towards cost center groups**.** However, some manual efforts are still required to meet all the requirements of fixed costs reporting.

5.3.2 Downloading data from SAP

This section provides a detailed step-by-step instruction on how to download the data from SAP by using transaction code **y01k_ysis**. Section 4.1 has pointed out that the mix up of fixed and variable costs happened in the newly introduced system is the major drawback of the new concept reporting's adoption in 2015. From this section and onward, the author mainly spotlights the procedure and techniques of applying the new concept. For a better grasp of how to work with SAP, the guidelines presented here are based on two assumptions. Firstly, the current splitting of fixed and variable cost in the system is correct; to be more precise, the data of 2015 in SAP is valid. Secondly, the data is downloaded in February 2015 when only actual January data is available.

Figure 19 illustrates the process of downloading FC's actual January fixed costs data and its plan data for the whole year. After entering the transaction code **y01k_ysis** in the command field, the following selection parameters screen would show up.

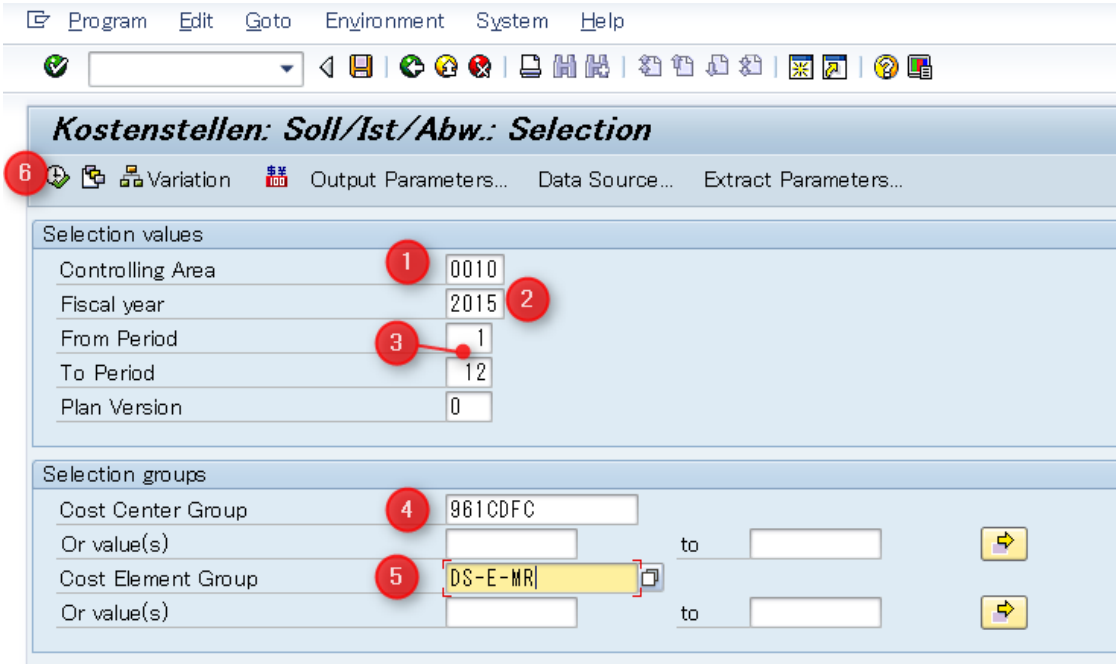


FIGURE 19. Downloading fixed costs of FC by using transaction code **y01k_ysis**

Step 1: enter "0010" to the Controlling area.

Step 2: fill in "2015" for the current fiscal year.

Step 3: from period "1" to period "12" means that any available data of the whole fiscal year would be shown. As explained in the previous section 5.3.1, the actual fixed costs and plan fixed costs are indicated as cumulative sums of previous months until the present. In February, only actual January fixed costs are available. The current fixed costs of February are recorded temporarily as variable costs up until the closing month. Therefore, by entering from period "1" to period "12", the actual fixed costs displayed in the transaction are the "monthly" fixed costs of January, while plan fixed costs are still total plan fixed costs of the whole year. For the purpose of comparison, plan fixed costs data is needed in terms of total annual plan costs rather than a monthly plan costs.

Tips: to download the actual monthly fixed costs in the next month and onward, i.e., in the beginning of March, from period "2" to period "2" will need to be filled in step 3 instead of "1" and "12". By doing this, the transaction will display the actual monthly fixed costs of February only, in which January data has been skipped. Similarly, enter from period "3" to period "3"for the actual March fixed costs to be reported in April.

Step 4: 961CDFC is the cost center group of FC, where total overhead costs of FC are shown. Likewise, 961CDMG is the total overhead costs of MG.

Note: cost center group of NE, QM, and SA are 961CDNE (including costs of DGS-ES/RBU-JP), 961CDQM, 961CDSA respectively. In case of **Others**, which include RP and CP, the cost analyst has to download the fixed costs of RP and CP accordingly by entering their cost center groups as 961CDRP and 961CDCP. Please be aware that, there might be a separate cost center group for DGS-ES/RBU-JP next year. Reporting together with NE (similar process of downloading and combining data as **Others**) or presenting it separately depends on the specific needs of the controlling team.

Step 5: always fill in "DS-E-MR" to attain the cost groups listed on page 40.
Step 6: finally click on the clock button to execute the transaction.

SAP offers a function to review and download in a spreadsheet-like layout. The transaction code **y01k_ysis** displays a wide array of information, but not all of them are relevant to the target of fixed costs tracking. Hence, the researcher recommends simply copying the required data in SAP and pasting it to the fixed costs report prepared in Excel, instead of downloading the full report in SAP. The next section describes the process of updating the database in Excel.

5.3.3 Updating a database in Excel

Figure 20 describes the process of updating the **Data** spreadsheet in fixed costs report with data acquired from SAP, the case of FC.

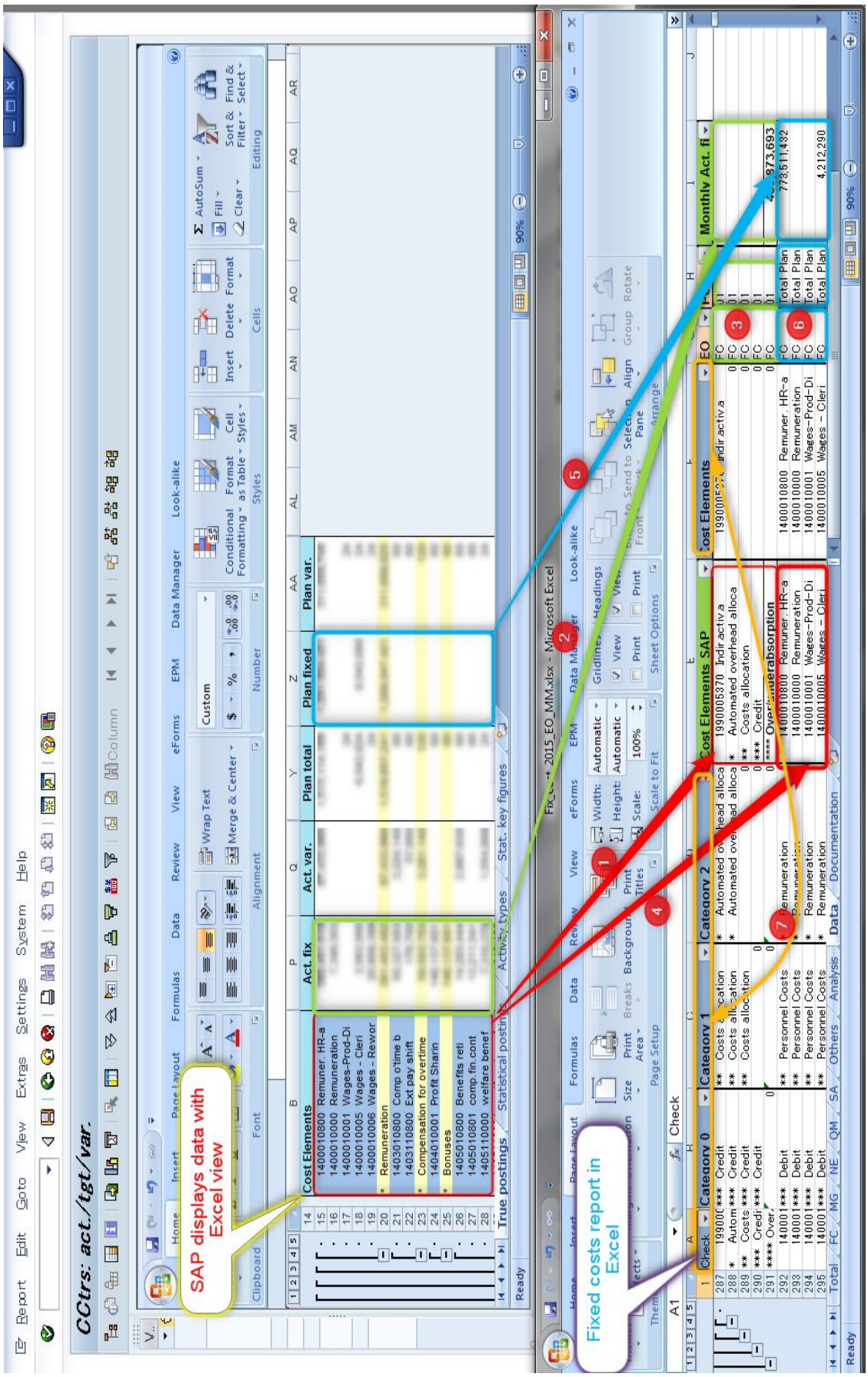


FIGURE 20. Updating the **Data** spreadsheet in fixed costs report with data acquired from SAP

SAP presents the data under the form of an Excel file once executing the transaction. The upper part of figure 20 noted with "SAP displays data with Excel view" is the interface screen when the transaction is accessed. For simplicity purposes, the researcher has removed unnecessary columns in SAP. The procedure of updating the **Data** spreadsheet is described as follows:

Step 1: copy all CEs located in column B in SAP and paste it to column E ***Cost Elements SAP*** in the **Data** spreadsheet of the fixed costs report.
Step 2: in SAP, copy actual fixed costs ***Act. fix*** in column P and paste it to column I ***Monthly Act. fix*** of the report.
Step 3: at the same time, in the **Data** spreadsheet, fill in column G with "FC" as where the costs incurred; and column H with "01" to indicate the actual fixed costs of January.
Step 4: repeat step 3 by coping again all CEs in column B in SAP and paste it to column E ***Cost Elements SAP*** in the **Data** spreadsheet of the report.
Step 5: in SAP, copy ***Plan fixed*** locating in column Z and place it to column I ***Monthly Act. fix*** of the report respectively to the CEs, which have just been pasted in step 4.
Step 6: in the **Data** spreadsheet, note column G with "FC", and column H with "Total Plan" as the total plan fixed cost of FC for the whole year.
Step 7: columns A, B, C, D, and F in the **Data** spreadsheet are fulfilled with excel formulas. After updating column E and I with data obtained from SAP and manually filling column G and H, press F9 to refresh the formulas. The data in those columns should automatically show up.

Note: as total plan fixed costs do not change during the year, step 4, 5 and 6 are only needed once, when reporting January actual fixed costs in February. From March and onward, only step 1, 2, 3 and 7 are required.

The database of the report needs to be updated every month and for each EO separately. The order of EO and period for updating is not necessary as long as ***Cost Elements SAP***, ***Monthly Act. Fix***, ***EO*** and ***Period*** column of that EO remain in line with each other. Every month, especially in the beginning of the year, there is a possibility of new CEs showing up even though it is very low. Therefore, updating each month's data with top-down approach like this, none of new CEs would be missed.

5.3.4 Refreshing PivotTable in Excel for the purpose of analysis

In order to support the understanding of using PivotTable for analysis, the author has updated the data source in the **Data** spreadsheet with actual fixed costs of FC and MG over the course of January, February and March. The costs in SAP follow a certain hierarchy as shown in figure 21. The more stars the category has, the higher level it is.

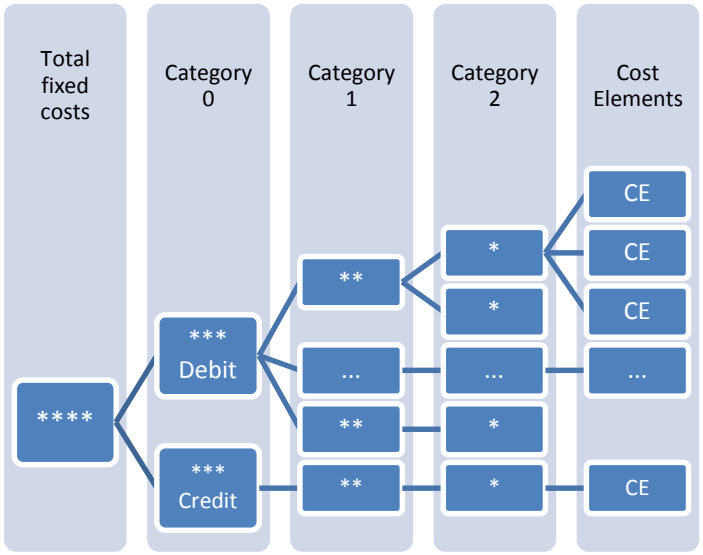


FIGURE 21. The hierarchy of costs in SAP

The **Data** spreadsheet is not only the database for reporting fixed costs of each EO (**FC, MG, NE, ME, SA, Others** spreadsheet), but also a data source of PivotTable in **Analysis** spreadsheet. Based on the way of the costs are grouped in SAP, the researcher set up the Excel formulas in **Data** spreadsheet so that the data in PivotTable is displayed organized and neatly but still flexibly to switch between EO.

Getting back to section 5.3.3, after updating the database in the report with actual fixed costs of the first three months, the cost analyst needs go to the **Total** spreadsheet to change the number in cell B1 (see figure 17). This number represents the latest month in the database and is the factor of the ***traffic light*** computation. Each EO spreadsheet is updated accordingly once the database and the factor are ready. Going through each EO spreadsheet allows the cost analyst to identify the areas that require for further investigation. Figure 22 supplements a detailed instruction of how to thoroughly track and analyze fixed costs by using PivotTable.

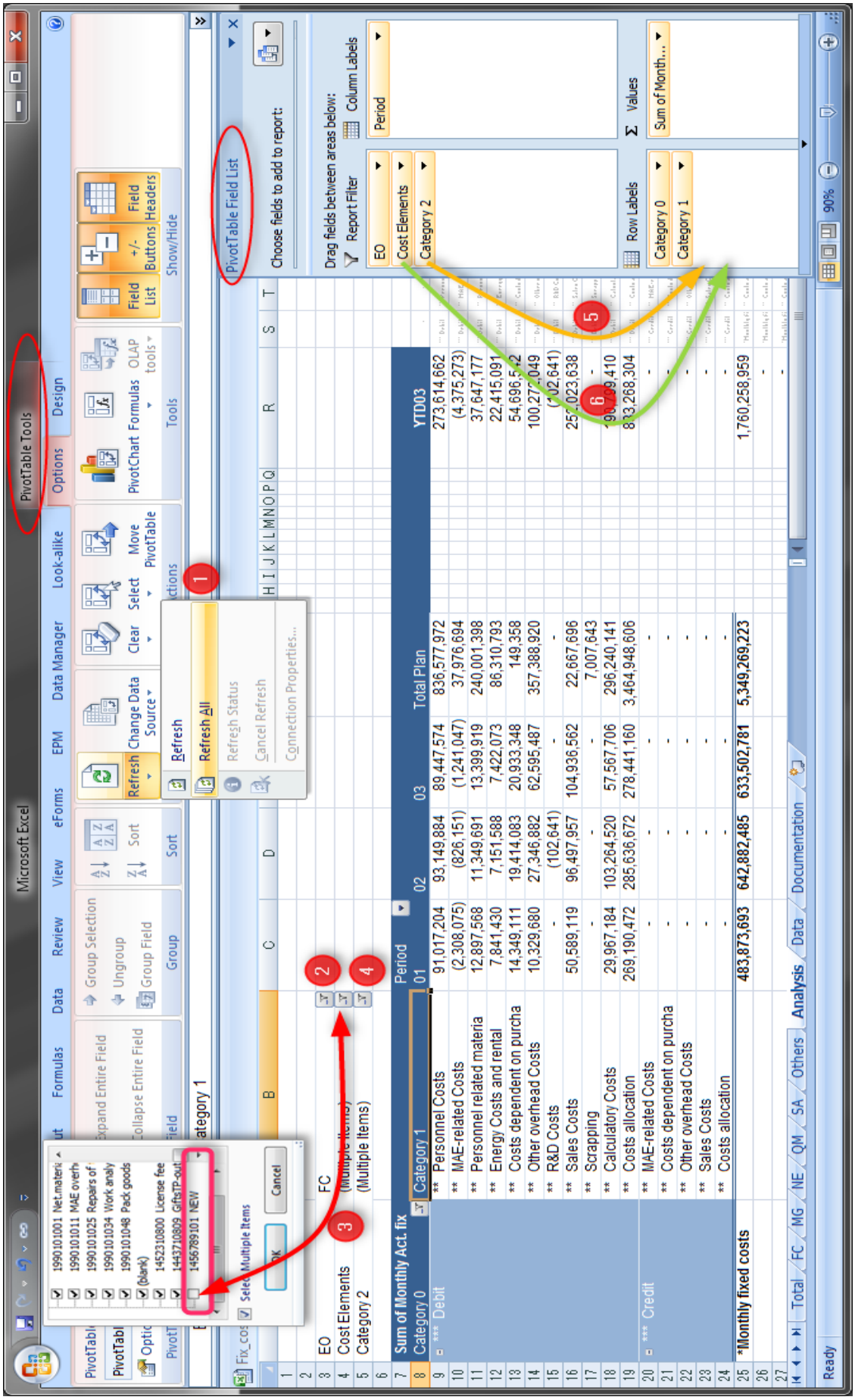


FIGURE 22. Refreshing and arranging PivotTable in the **Analysis** spreadsheet

Step 1: click anywhere in the PivotTable to display ***PivotTable Tools*** on the ribbon and ***PivotTable Field List*** on the right hand side. In ***PivotTable Tools***, select ***Options → Refresh → Refresh All*** to get the latest data in the **Data** spreadsheet.
Step 2: in ***EO***, filter for the EO that is required for analysis. In this case, choose "FC".
Step 3: in ***Cost Elements*** area, click "All" but exclude "0"**.** Zero (0) is the set of other categories that start with at least one star (*) rather than ***Cost Elements***.

Tips: concerning the possibility of new CEs might appear in March - for example, click filter button in ***Cost Elements*** without selecting any new items yet. Go to the end of the list to check if there are any CEs have not been selected. In figure 22, CE 1456789101 named "NEW" is the new one firstly showing up in March. The PivotTable automatically reapplies the filter criteria specified in the previous months. Consequently, the checked boxes in the section screen are the CEs presenting in January and February. CEs that newly appear would be always at the end of the list with the sign of blank square box to indicate of not being selected yet. After identifying which CEs are new, the cost analyst can proceed step 3 by clicking "All" but excluding "0" to ensure both old and new CEs are displayed. The other option to determine the new CEs is looking at ***Total Plan*** column in PivotTable. Once step 3 to step 6 are completed, the cost analyst can see total plan data of each CE. The ones that have no plan cost are the new CEs.

Step 4: in ***Category 2***, check if "All" items but "0" are chosen. Again, zero represents items in other categories, which are ***Category 0***, ***Category 1***, and ***Cost Elements*** rather than ***Category 2*** itself. New items might only appear at cost element level, no adjustment of filtering criteria should be made for other categories.
Step 5: this is the original view of ***PivotTable Field List***. In ***Report Filter*** section, drag ***Category 2*** down to ***Row Labels***, place it right after ***Category 1***.
Step 6: similarly, pull ***Cost Elements*** in ***Report Filter*** down to ***Row Labels*.** Make sure the order in ***Row Labels*** is kept as ***Category 0 → Category 1 → Category 2 → Cost Elements***.

The full PivotTable is shown in Appendix 4. Grouping buttons throughout the line items allow the cost analyst to expand or collapse the list at different levels. (***Tips***: double click to open or close the group instead of using the grouping buttons). Eleven blank columns lying between ***Total Plan*** and ***YTD*** are the spared space to move ***Category 2*** and ***Cost Elements*** in (step 6), and to update the next nine months. In the end of the

year, all the blank columns will be filled. The last column ***YTD*** is inputted with Excel formula so that the figures are adjusted accordingly as the groups expand or collapse. Start again from step 2 to step 4 to switch to another EO. Finally, move ***Category 2*** and ***Cost Elements*** back to ***Report Filter*** in order to return the original view of the PivotTable when completing the analysis for all EO.

6 DISCUSSION

Cost controlling is an important managerial practice to secure value in a volatile economic environment and to generate profitable growth for any firms including the Diesel Systems division at Bosch in Japan.

In response to the need of tracking fixed costs efficiently, this thesis aimed to develop a new fixed costs reporting concept under a newly introduced IT tool. To provide a practical solution for improving the process of fixed costs tracking, the constructive research approach was chosen with a combination of both qualitative and quantitative methods. In terms of data collection, some of primary data and a wide range of secondary data were gathered. Resources for references included text books of accredited publishers, articles and online sources related to cost accounting, cost management, and SAP system, along with internal sources of information. These sources not only support the construction of a solid theoretical background for the development of a new concept, but also assure that the new fixed costs reporting concept is in line with the division's requirements and standards.

The commissioner party of the thesis is the Diesel Systems division at Bosch in Japan (DS-JP) that is a member of Bosch's Diesel Systems organization. DS-JP is known as one of the leading suppliers of Diesel Systems Technology in Japan and Asia market. The Controlling, Finance and Administration department (CFA) is responsible for generating internal reports, which support the analysis and controlling processes. Fixed costs steering is one of the important controlling practices in DS-JP as it leverages the potential market risks. Therefore, the fixed costs report is a basic report to keep track of the state of fixed costs incurring. Eight hours per month was an average working time needed to generate a fixed costs report, under the old SAP system. The newly upgraded SAP, which was implemented in the beginning of 2015, is more automatic and integrated. However, the working routine in the past is not compatible with the new system anymore. The need of a new reporting concept that can utilize the new system emerges as a result. Less time spent in reporting would allow more capacity for meaningful activities that create value added to the company.

The new concept for fixed costs tracking not only speeds up the reporting process for timely decision making, but also provides adequate and accurate information for a reliable management reporting and a target-oriented steering. Instead of tracking all fixed costs, the new reporting concept captures fixed costs on cost center level. Specifically, it is developed to observe fixed overhead costs only. The new concept strives to draw management's attention to what really matters with a wide and in-depth insight of the relevant topics.

The new fixed costs reporting concept is tailor-made to meet DS-JP's specific needs of reporting fixed costs by each EO. It has been accepted by the commissioner party, in particular of CFA department. Nevertheless, the main challenge of mixed-up data in the system has prevented the author and the commissioner from gaining a solid testing result, as well as proceeding to the adoption of the new concept in the fiscal year 2015. The challenge originated from the implementation of the new SAP, which is also acknowledged by CFA team, could be only solved next year. The immediate future might look uncertain and the value of the new concept cannot be seen right away. However, long-term prospects are truly promising.

The testing has shown that the new reporting concept can cover more than 87 percent of total fixed costs in P/L. The missing parts belong to warranty costs, license fees and sample costs, etc. For the time being, the result in the testing section of the study is the most accurate estimation of the new fixed costs reporting concept's applicability. The concept will be applied in the beginning of 2016 as a "trial stage". Some additional testing efforts with valid data might be necessary to fully exploit the value of the new concept. The idea behind it and the design of the reporting template presented here are, by no means, the only way that can be used. With a more extensive combination of SAP and Microsoft Excel program such as new transaction code, application of macros, and add-on software, etc., it has potential for further improvement and development to meet more specific needs of the division.

The new reporting concept approaches fixed costs that matter to the controlling team with an attempt to eliminate manual work and to utilize the new IT tool as much as possible, while providing meaningful information and highlighting crucial areas that need management's attention. The findings in this thesis would be applied for the purpose of fixed costs tracking within the Diesel Systems division in Japan. Despite the presence of

solid theoretical background and detailed manual guidelines in this thesis, in-depth understanding of the inner working environment, as well as skills in using SAP and financial analysis, are strongly recommended to successfully exploit the value of the new fixed costs reporting concept.

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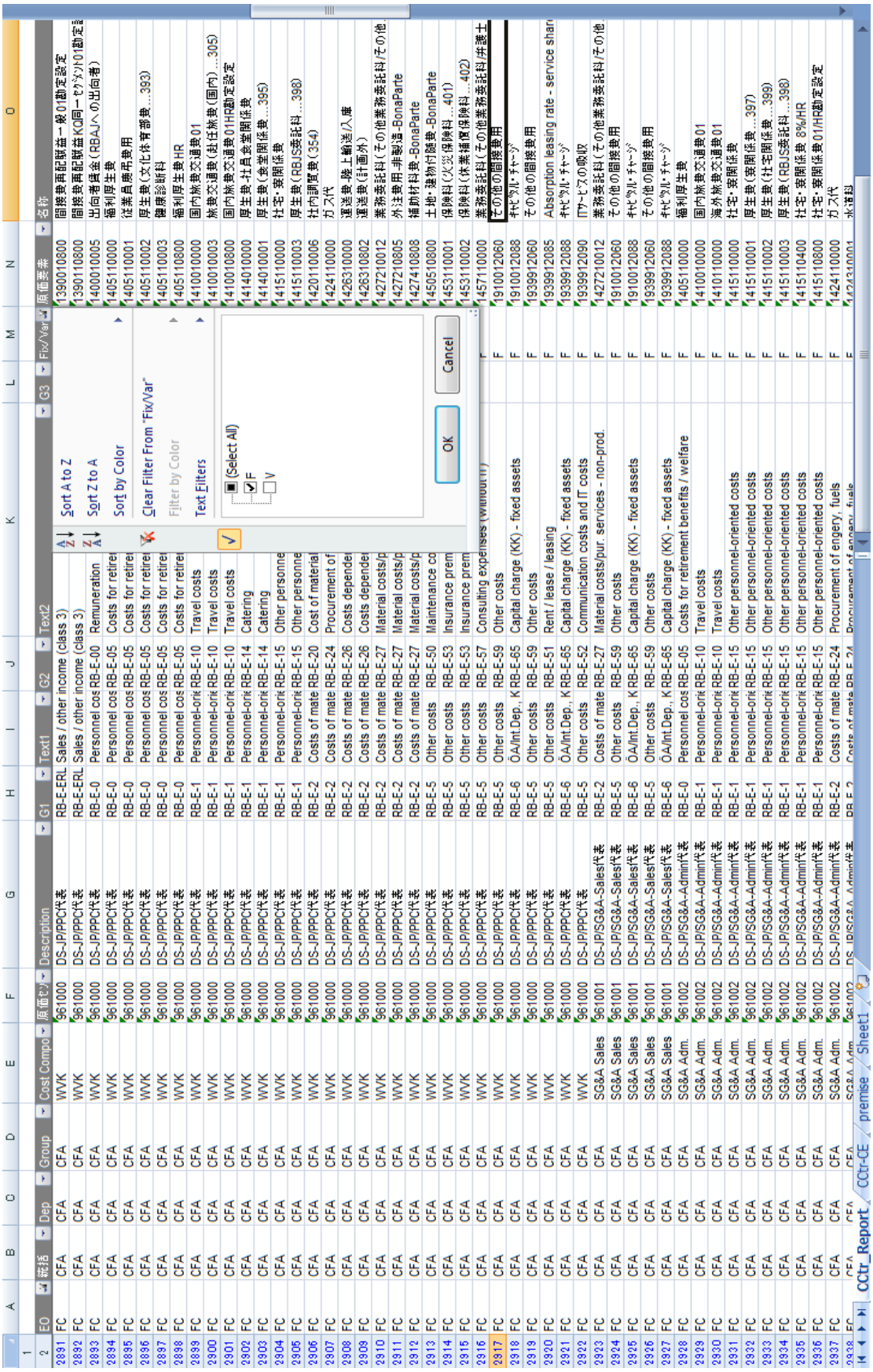
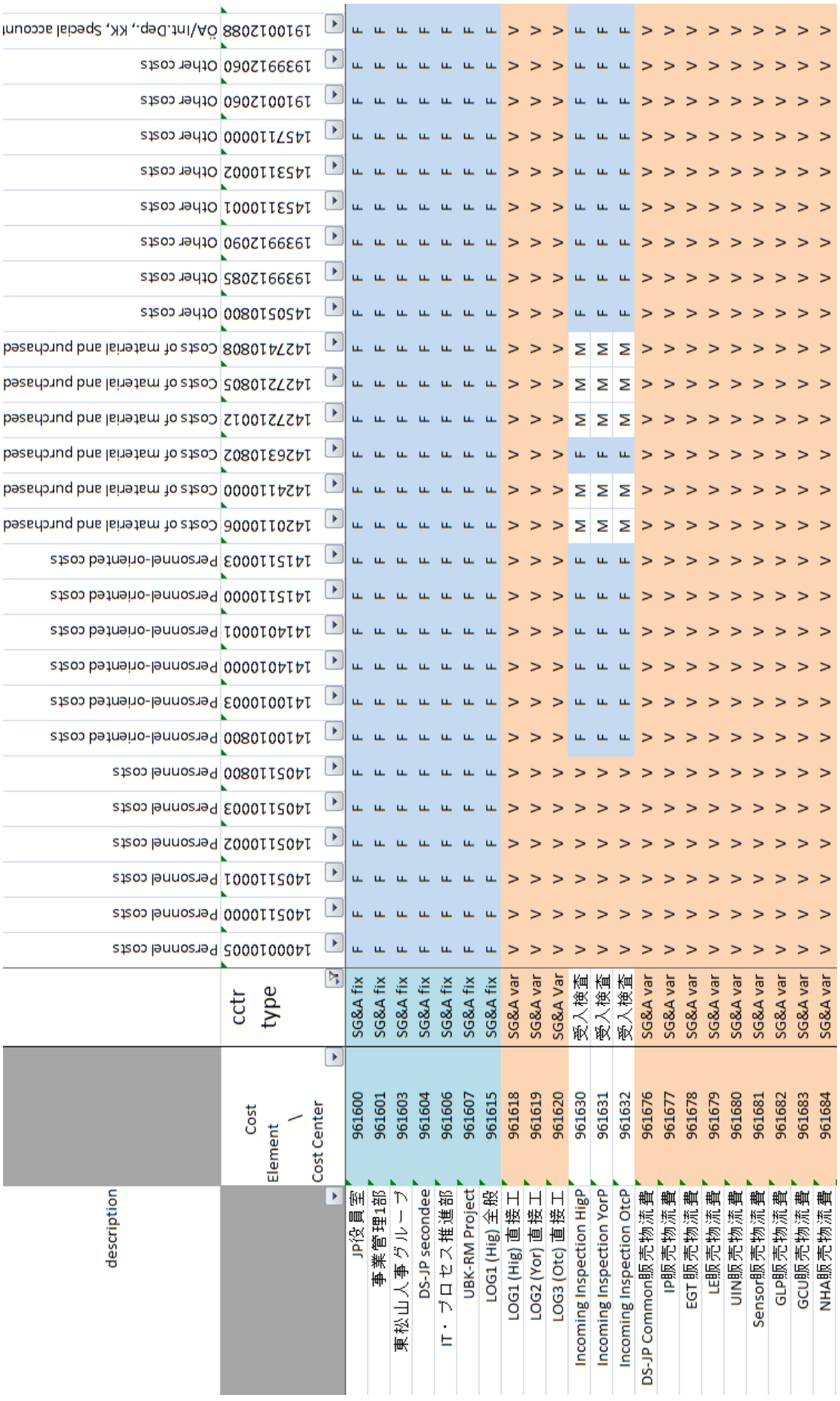
APPENDICES

Appendix 1. Cost centers report. Adopted from CFA1's team meetings



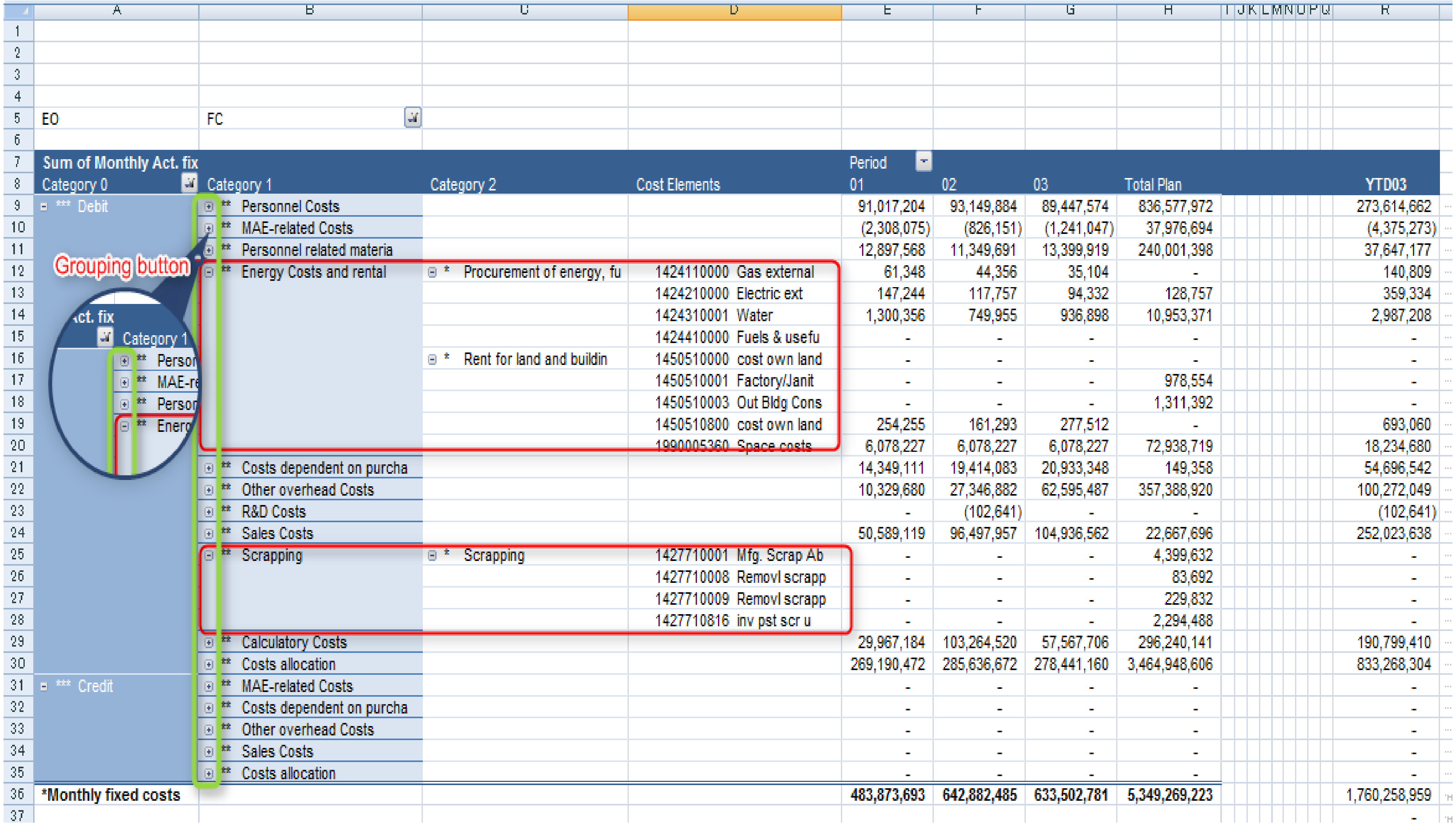
Appendix 2. Part of the matrix table. Adopted from CFA1's team meetings



Appendix 3. Handpick for cost centers containing fixed costs

		By EO					
		FC	MG	NE	QM	Others (RP+CP)	SA
Cost Center	Only fixed costs	961000 - 961006 961010 961015 961017 - 961018 961022 961039 961100 961601 - 961604 961606 - 961607 961610 - 961617 961621 - 961622	961071 - 961072 961077 961081 961083 - 961084 961101 - 961103 961110 - 961121 961130 961200 961290 961295 961300 961351 961366 961368 961411 - 961412 961414 961420 - 961431 961440 - 961446 961450 - 961458 961460	961500 961503 961510 - 961512 961520 - 961528	961800 961802 961804 - 961811 961813 - 961814	961600 961630 - 961637	961540 - 961546 961700 - 961710
	Both fixed and variable costs	961040 - 961041 961043 - 961047 961049 961051 961053 961056 961058 - 961062 961605	961065 961067 961076 961078 - 961079 961086 961131 - 961142 961151 - 961153 961160 - 961170 961180 961190 - 961193 961201 - 961207 961210 - 961214 961220 - 961224 961230 - 961235 961240 - 961242 961250 - 961253 961260 - 961264 961270 - 961277 961280 961291 - 961294 961301 - 961302 961310 - 961313 961320 - 961332 961340 - 961346 961350 961360 - 961361 961363 - 961364 961367 961370 - 961376 961380 - 961384 961390 - 961392 961400 961413				

Appendix 4. Analyzing FC's fixed costs by using PivotTable in Excel



EO	FC							
Sum of Monthly Act. fix				Period				
Category 0	Category 1	Category 2	Cost Elements	01	02	03	Total Plan	YTD03
*** Debit	** Personnel Costs			91,017,204	93,149,884	89,447,574	836,577,972	273,614,662
	** MAE-related Costs			(2,308,075)	(826,151)	(1,241,047)	37,976,694	(4,375,273)
	** Personnel related materia			12,897,568	11,349,691	13,399,919	240,001,398	37,647,177
	** Energy Costs and rental	* Procurement of energy, fu	1424110000 Gas external	61,348	44,356	35,104	-	140,809
			1424210000 Electric ext	147,244	117,757	94,332	128,757	359,334
			1424310001 Water	1,300,356	749,955	936,898	10,953,371	2,987,208
			1424410000 Fuels & usefu	-	-	-	-	-
		* Rent for land and buildin	1450510000 cost own land	-	-	-	-	-
			1450510001 Factory/Janit	-	-	-	978,554	-
			1450510003 Out Bldg Cons	-	-	-	1,311,392	-
			1450510800 cost own land	254,255	161,293	277,512	-	693,060
			1990005360 Space costs	6,078,227	6,078,227	6,078,227	72,938,719	18,234,680
	** Costs dependent on purcha			14,349,111	19,414,083	20,933,348	149,358	54,696,542
	** Other overhead Costs			10,329,680	27,346,882	62,595,487	357,388,920	100,272,049
	** R&D Costs			-	(102,641)	-	-	(102,641)
	** Sales Costs			50,589,119	96,497,957	104,936,562	22,667,696	252,023,638
	** Scrapping	* Scrapping	1427710001 Mfg. Scrap Ab	-	-	-	4,399,632	-
			1427710008 Removl scrapp	-	-	-	83,692	-
			1427710009 Removl scrapp	-	-	-	229,832	-
			1427710816 inv pst scr u	-	-	-	2,294,488	-
	** Calculatory Costs			29,967,184	103,264,520	57,567,706	296,240,141	190,799,410
	** Costs allocation			269,190,472	285,636,672	278,441,160	3,464,948,606	833,268,304
*** Credit	** MAE-related Costs			-	-	-	-	-
	** Costs dependent on purcha			-	-	-	-	-
	** Other overhead Costs			-	-	-	-	-
	** Sales Costs			-	-	-	-	-
	** Costs allocation			-	-	-	-	-
*Monthly fixed costs				483,873,693	642,882,485	633,502,781	5,349,269,223	1,760,258,959